WESTERN GAS

June
1933

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DISCUSSED IN THIS ISSUE

JUN 11 1933

- Connecting Rod Angularity in Gas Engines
- Metal Spraying at Compressor Stations
- Underfiring a Coke Oven with Propane
- An Automatic Compressor for Stand-by
- Converting Metallurgical Furnaces
- Fundamental Combustion Reactions
- Unit Type Meter Houses
- Sales Promotion Digest

Together with selected news and shorter features

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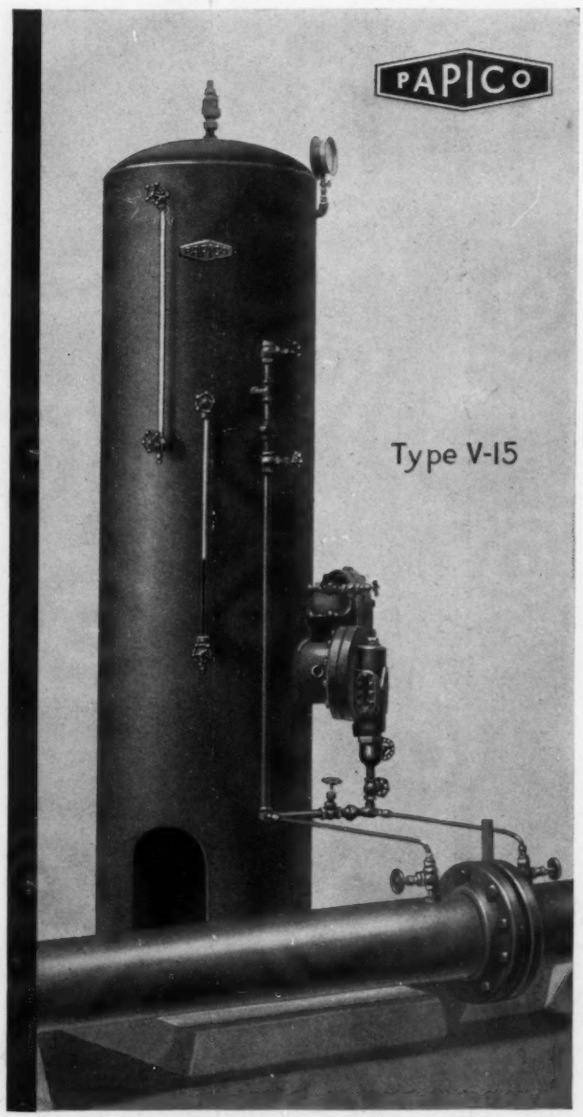

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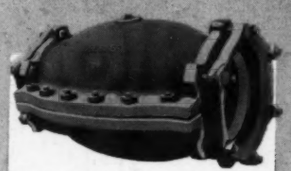

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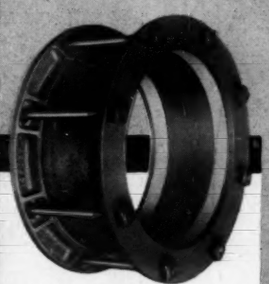

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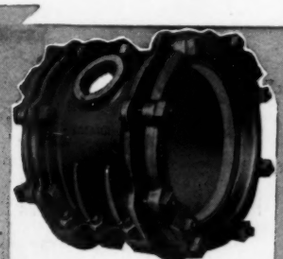

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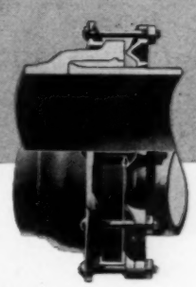
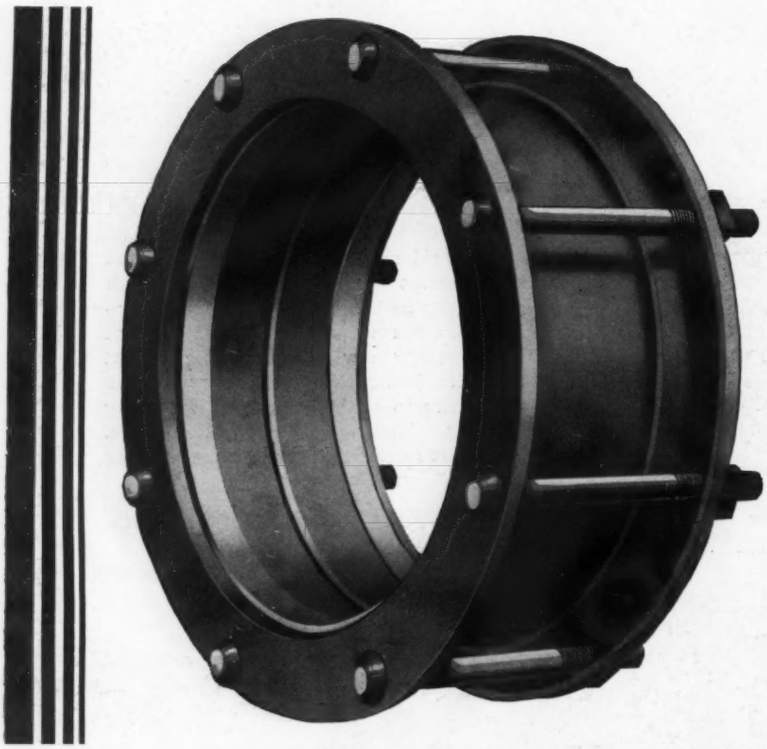


Dresser Bell Joint Clamps, Style 4½-HP, offer an effective and permanent means of repair for all leaking bell-and-spigot joints.

DRESSER

June, 1933. Volume IX. Number 6. Western Gas is published by Western Business Papers, Inc., at 810 South Spring Street, Los Angeles, California. Subscription price (in advance) 20 cents the copy; $2.00 per year; 2 years, $3.00; $2.00 per year foreign. Entered as second class matter June 1, 1925, at the postoffice at Los Angeles, under the Act of March 3, 1879.

DAYTON



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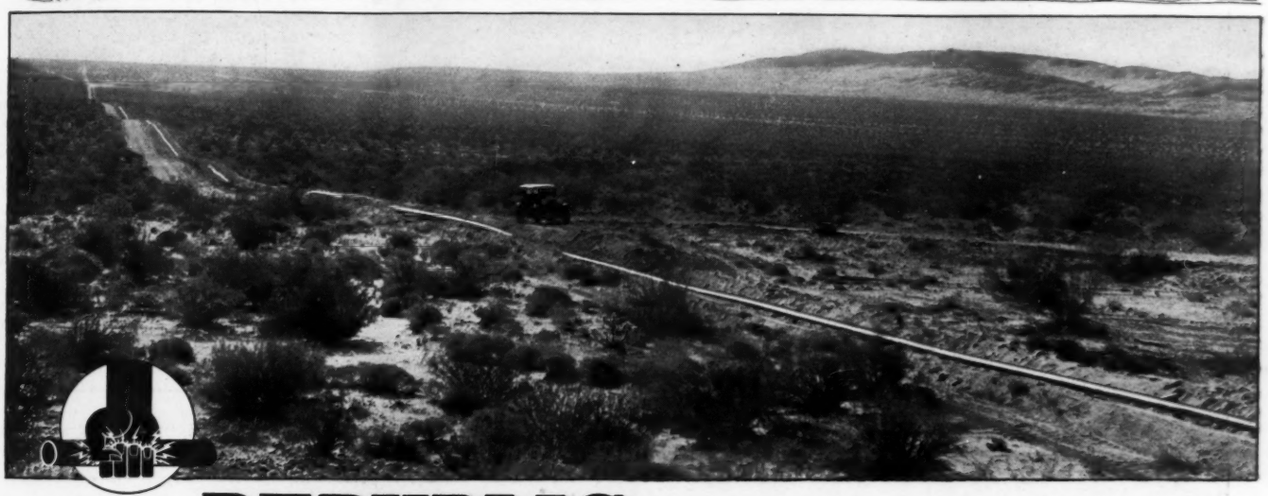

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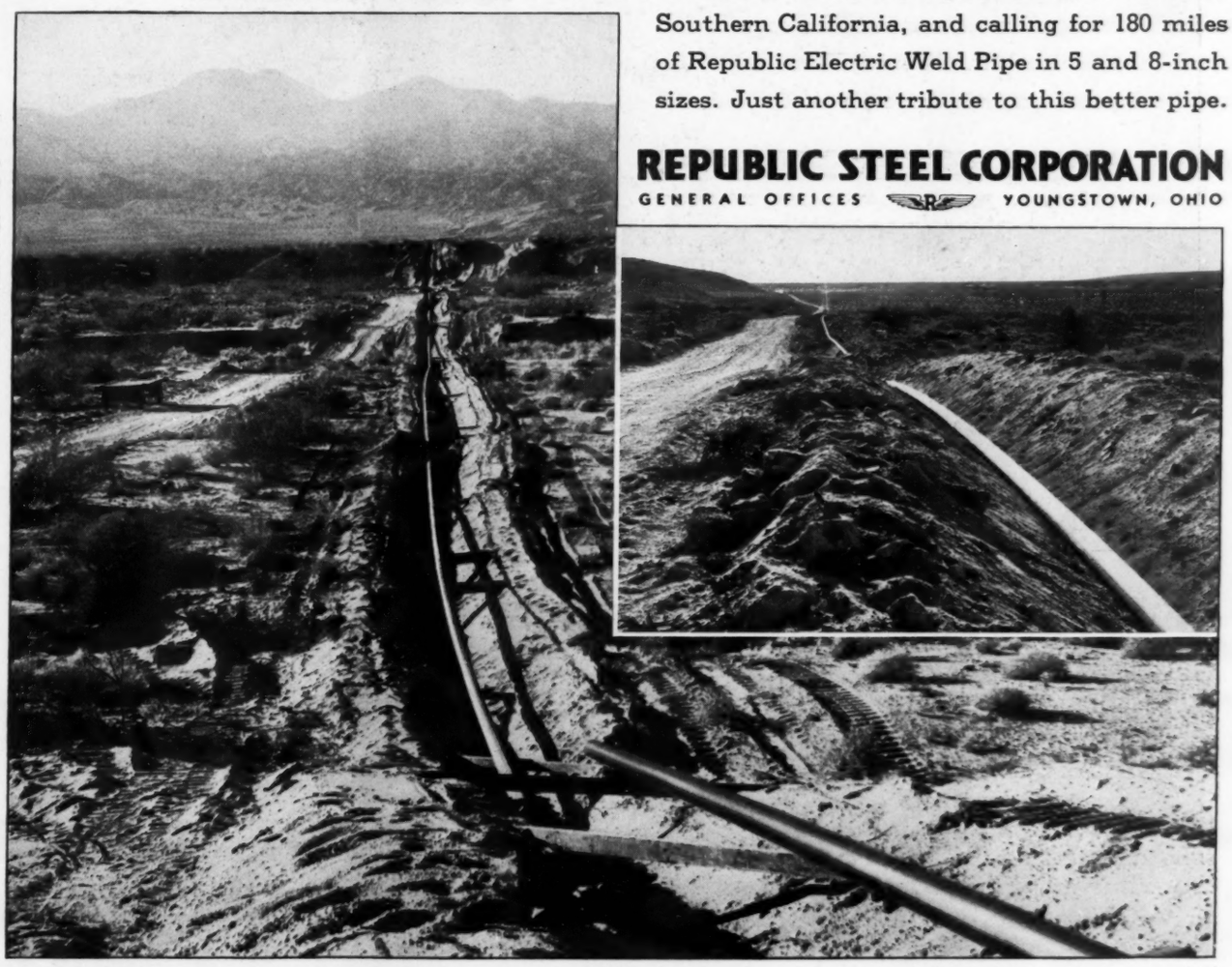

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"Reg. U. S. Pat. Off."

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June, 1933

WESTERN GAS

"Reg. U. S. Pat. Off."

Vol. IX, No. 6

A Monthly Journal of the Gas and Gas Appliance Industries in *Western America*

Review of the Month

Basic Signs of Revival for Those Who Will Read

THOSE who are willing to be convinced that business is showing basic improvement may take courage from the results of Secretary of Commerce Roper's end-of-May nation-wide survey. Covering 21 industries, the inquiry found 18 reporting definitely improved conditions, only 3 claiming continued depression.

Among the improved 18 were such industrial leaders as these: Steel mills, automotive manufacturers, farm implement makers, meat packers, wool manufacturers, boot and shoe makers. Registering the consumer pulse even more closely, dry goods and grocery stores showed good gains, as did credit associations also. Motion pictures, petroleum production, and cement manufacturing were the three "still depressed" industries touched in the survey.

To give some of the detail of the above trend:

The automotive industry for April of this year produced 22 per cent more units than in April 1932. Steel mills, as of May 24, were operating at 38 per cent of their rated capacity—the highest national average since June 1931. Steel production, incidentally, has increased continuously since the last week in March.

Other business indices point in the same upward direction: Newspaper advertising volume is growing; prices are on the rise, and normally so, since monetary manipulation has been inconsiderable thus far. Farm prices, for example, rose 17 per cent from April 15 to May 15—largest gain for any month since April, 1919. While stock market sales represent a questionable barometer, this index too, contributes to the positive evidence of revival; "average highs" in recent days have set new records for the past three years. Volume of industrial production, by the Federal Reserve Board's seasonally adjusted index, rose 7 per cent from March to April. For the week ended May 27 electric power output was 4.8 per cent ahead of the same week last year—largest weekly gain since February 1, 1930, and the fourth successive increase over the 1932 period. Financial pages begin to take on their former normal complexion, mixing a due share of earnings reports, dividend and expansion news, into the day's grist.

The gas industry should be among the first to feel the quickened pace of business, in sales to large industrial plants, in increased demand from commercial and smaller industrial consumers, in a pick-up in domestic meters and per-customer-usage which will follow re-employment and general return of confidence. Sales gains are already to be seen in some sections; Pacific Coast Gas Association figures for the first quarter of the year reveal a 7.6 per cent increase in the commercial-industrial classification for California, over the first quarter of 1932. From May 1 to May 6 the Gas Appliance Society of California in its annual Gas Range Week sold 2000 ranges at the highest unit price ever achieved in this event (upwards of $125)—more sales, at better prices.

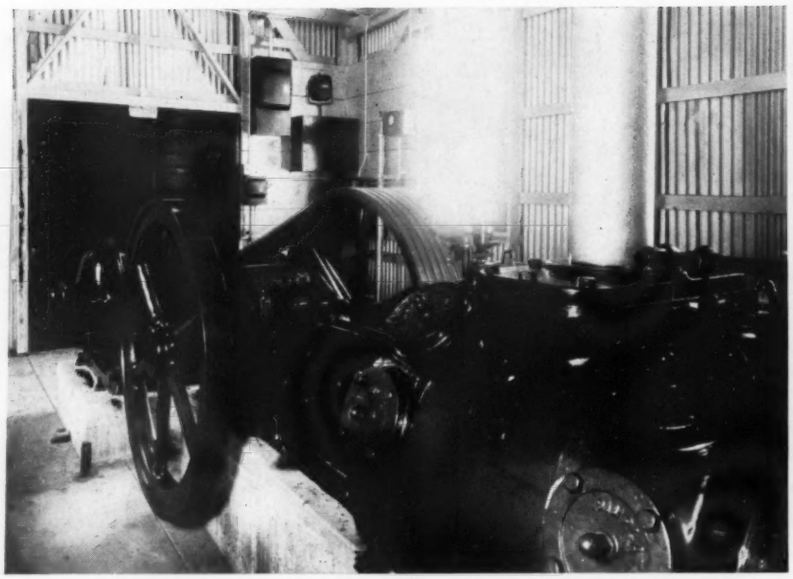
Evidence of the sort introduced above deserves its day in court—not to create false optimism, but to stir industries and individuals out of the tendency to expect the worst. Now is a good time to lay the groundwork, establish the contacts, prepare the materials that will be required to do "business as usual" in normal good times.

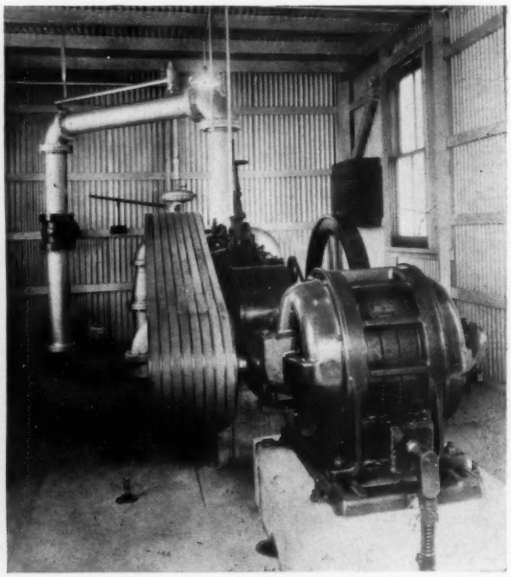
More Smoke Than Fire in Legislative Halls

National and state legislators continue to give a generous share of their attention to utilities. Proposals to restrict utilities to the state courts for determining their legal rights, to levy various and sundry forms of taxation, and enact long-pending Muscle Shoals legislation are leading samples. Judging from previous experience, little enacted legislation will come from this welter of proposed bills. Alexander Forward, managing director of the A.G.A., told Southern Gas Association members last month that the Association has kept in touch with legislation proposed in more than 40 state legislatures, with bills seeking to limit earnings, oppressively regulate, prohibit merchandising, and in other ways to embarrass public services; yet with most of these legislatures now adjourned the record shows surprisingly few laws enacted counter to the best interests of utility services. In the nature of things, legislators must attempt to legislate.

Gas Exhibits at Chicago Formally Dedicated

As this issue goes to press the gas industry is preparing to dedicate its exhibit at the Chicago Century of Progress Exposition. At 11 o'clock of Saturday morning, June 3, the ceremonies are taking place in Gas Industry Hall. The Home and Industrial Arts Group will house the principal gas displays, and it is good business for every company in the industry to publicize these exhibits as widely as possible.





Two general views of automatic compressor at Salinas, Calif. Pressure governor is seen mounted on wall in the view at left; note the suction type regulator in background of view at right.

Automatic Compressor *for* Emergency Service *at* Salinas, Calif.

By HARRY J. SMITH

Engineer of Construction
Department of Gas Construction and Operation,
Pacific Gas and Electric Company

THE first natural gas from Kettleman Hills was delivered to the town of Salinas, Calif., on December 9, 1929, and was served to the consumers through a low pressure distribution system, thereby shutting down the oil gas generating plant at that time.

Due to the increased demand for natural gas, the low pressure distribution system was inadequate to supply the demand and on October 19, 1931, the distribution system was cut over to a 2½ pound gauge pressure. The increase in pressure required the installation of a compressor, so that the 200,000 cubic foot, two-lift, telescopic, low pressure storage holder could serve this town in case of a failure to the transmission line or from any other cause.

After a complete study was made of all types of compressors, including the centrifugal type, and taking into account that the maximum delivery pressure to the distribution system would increase as the demand increased, it was decided that an automatic, motor driven, reciprocating compressor could be made to operate with a mininmum amount of attention and would give greater flexibility over a wide range of discharge pressures.

Harry J. Smith

On May 2, 1932, the reciprocating compressor was placed in operation and was a success from the start. It is a simplex unit, having a 20-inch diameter cylinder and a 10-inch stroke, with a speed of 285 revolutions per minute. The actual delivery is 59,700 cubic feet per hour at 2 pounds gauge discharge and 53,400 cubic feet per hour at 15 pounds gauge discharge.

The compressor is belted to a high torque, 60 horsepower motor with sliding base, 870 revolutions per minute, full load speed, 440 volts, 3 phase, 60 cycles. Eight V-belts are used and each belt is capable of developing 15 horsepower, or a total of 120 horsepower. The reason for using 120 horsepower in V-belts is that on account of this compressor being fully automatic, and the use of a high torque motor, it was thought advisable to over horsepower, so as to eliminate any possibility of a failure occurring from the V-belts.

The compressor suction and discharge valves are important to consider in an installation of this kind, as they must remain tight with the distribution pressure against them, as the suction and discharge gate valves must remain open for automatic operation.

Metallic packing was used for the piston rod, so that there would be no gas leakage around the rod and to eliminate scoring of the rod. The oiling system is a mechanical force feed system and is driven by a belt connected to the crank shaft. The crank shaft bearings are lubricated by the usual splash method.

The automatic features in connection with this installation are a pressure governor, across-the-line starter, solenoid operated water valve and a 6-inch suction type diaphragm regulator. These are shown in the pictures illustrating the installation of the compressor.

The town is supplied direct from the transmission line through regulators and

(Continued on Page 38)

Fundamental Combustion Reactions *of* Natural Gas

with special reference to the hydroxylation theory

By NORMAN L. HOFF

Assistant Engineer
Los Angeles Gas and Electric Corporation

WHEN a gas utility changes from manufactured gas to a straight natural gas everyone connected therewith realizes the necessity for changing appliance adjustments in order properly to utilize the new gas. Few, however, realize that they must also change practically all of their previous conceptions of the phenomena of gaseous combustion. Natural gas is almost as different from manufactured gas as is a solid or liquid fuel, that is, insofar as its method of burning is concerned. Many companies have recently completed appliance change-overs and it now appears timely that some consideration be given to a "change-over" of combustion ideas. It is the purpose of this paper to discuss as briefly and as simply as may be possible, the fundamental combustion reactions of natural gas.

Norman L. Hoff

Prior to about 40 years ago, scientists were practically agreed that hydrocarbon gases burned in accordance with what they called the "Theory of Preferential Combustion of Hydrogen." This theory assumed that oxygen had a greater affinity for the hydrogen in the hydrocarbon molecule than it had for the carbon. Therefore, it was believed that the hydrogen combined with the oxygen to form water and that free carbon was left to burn in a subsequent and more or less independent reaction.

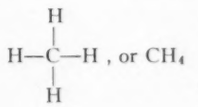
About 40 years ago Dixon* found evidence which indicated that the former theory was no longer tenable, and his researches led to the establishment of a new school of thought which favored the "Theory of Preferential Combustion of Carbon." This theory was in almost direct contradiction to the former preferential hydrogen theory.

In 1902, 1903 and 1904 Dr. W. A. Bone† and his collaborators formulated, as a result of their extensive experiments, still another theory which is now almost universally accepted. This theory, called the "Hydroxylation Theory" assumes that there takes place an initial interaction between the hydrocarbon molecule and the oxygen, forming an intermediate or "hydroxylated" compound. It is with this last theory that we shall deal in detail.

This theory will, perhaps, be best understood by considering the following structural formulae of the initial and intermediate compounds which it presupposes. We need concern ourselves with only two organic compounds, methane (CH_4) and ethane (C_2H_6), of which most natural gases are almost entirely composed.

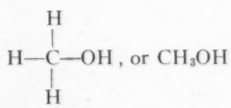
The Hydroxylation of Methane

Methane may be represented by the formula,



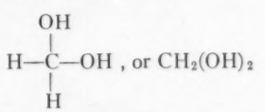
(Methane) .....(1)

Now, if a small amount of oxygen is allowed to react with the methane there will be produced,



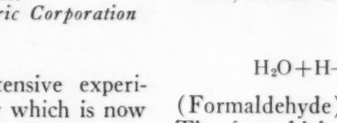
(Methyl Alcohol).....(2)

If a little more oxygen is added there is probably an instant of time when the following compound exists,



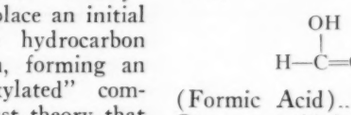
(Dihydroxy-methane) .....(3)

Dihydroxy-methane being decidedly unstable, breaks down immediately to,



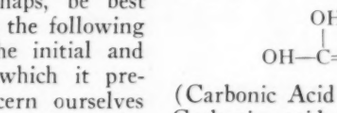
(Formaldehyde) .....(4)

The formaldehyde then oxidizes as follows,



(Formic Acid).....(5)

Oxygen combining with formic acid produces,



(Carbonic Acid).....(6)

Carbonic acid, being quite unstable, readily breaks down to,

$$CO_2 + H_2O.$$

The breaking down of formaldehyde in accordance with reactions (5) and (6) as shown, is the most complex of several ways it may occur. For example, it may break down thermally:

$$HCHO \rightarrow CO + H_2 \quad \text{.....(7)}$$

Or, it may react with oxygen, thus

$$\tfrac{1}{2}O_2 + HCHO \rightarrow CO + H_2O \quad \text{.....(8)}$$

Again, with an ample supply of oxygen, the reaction may be,

$$O_2 + HCHO \rightarrow CO_2 + H_2O \quad \text{.....(9)}$$

If methane is allowed to burn at temperatures varying from about 500°F. to 900°F., there is doubtless an appreciable amount of time required to convert the methane to carbon dioxide and water vapor. Under normal flame conditions, however, the reactions take place with a speed that is almost incomprehensible. Notwithstanding this terrific speed of reaction, it is not difficult to alter conditions in such a way that a continuous reaction is broken or interrupted. For obvious reasons, such a break or interruption in the reactions is

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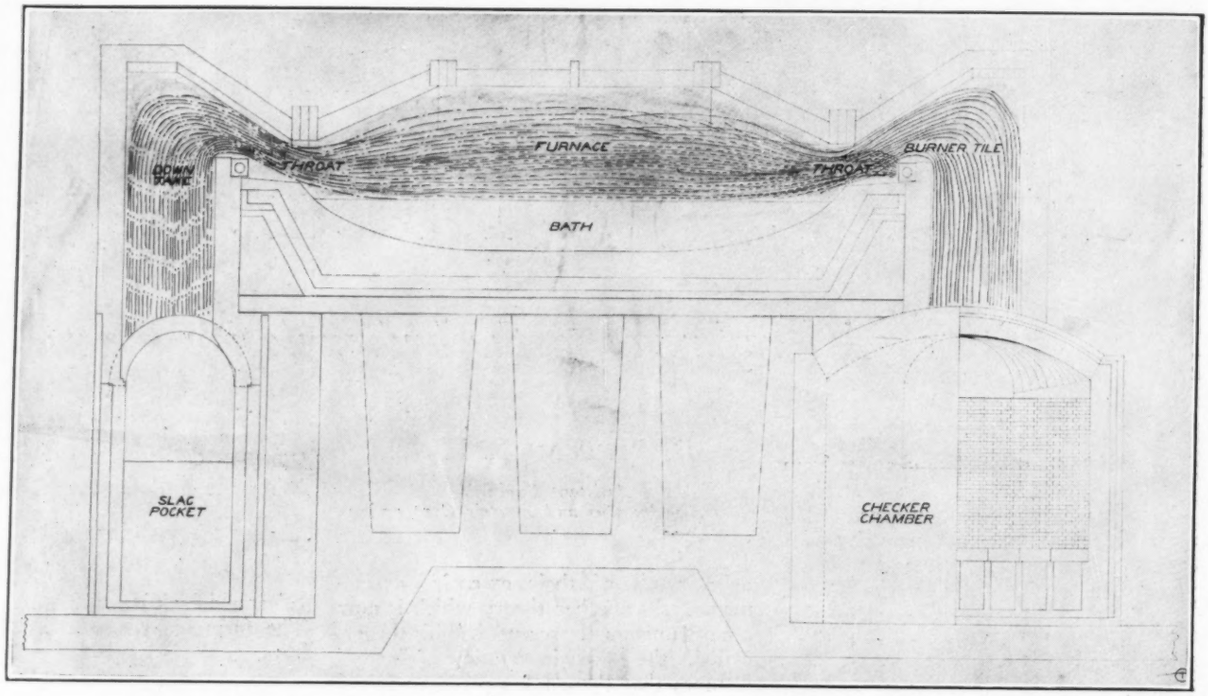

Fig. 1

Converting Metallurgical

By K. B. ANDERSON

ONE of the most fertile fields for the application of natural gas is in metallurgical processes. The advantages of gas in the forging and heat treating of metals have been established by many years of successful practice even in localities where only manufactured gas at high rates has been available. The scope of this paper embraces the more crude operations of smelting, melting, and refining of the raw materials. Since heat is the predominant factor in these processes the cost of a fuel is the guiding consideration in its choice and consequently natural gas is considered only in those localities where its cost is competitive with oil, coal, coke, or producer gas. Even with fuel cost on a competitive basis however it is necessary to develop fully the inherent advantages of natural gas in order to provide the margin necessary to justify the expenditure for utilization equipment and the potential liability of long term contract with minimum guarantees required by most gas companies. In determining this margin it is necessary to make a careful survey of the plant, ascertaining the various operating and maintenance costs, such as fuel handling and atomizing, which could be eliminated through the use of gas. Under this heading also comes the consideration of relative efficiency of combustion of the two fuels. On the one hand the engineer should not overlook greater loss due to the combustion of hydrogen in natural gas. This amounts to about 9 per cent as compared to 6 per cent for oil. He should also not fail to consider the difference in the radiating qualities of the flame as regards both efficiency and capacity. On the other hand the engineer should not overlook the increase in efficiency and maximum flame temperature which is made available due to the reduction in the excess air requirements of natural gas as compared to other fuels. In metallurgical furnaces this factor assumes considerable importance due to the high temperature of the rejected flue gases and their consequent sensible heat. Closely allied with the available margin of savings is the choice of the gas utilization equipment. The low cost of fuel minimizes the value of increased efficiency which the more elaborate equipment affords. The necessity of providing for the emergency use of oil also limits the degree in which the full advantages of gaseous fuel may be realized. In many metallurgical furnaces chemical conditions exist which shorten the life of refractories and other materials. The replacement costs in these cases operate against the higher priced equipment. Improved control of the reaction in the furnace and improved quality of the finished product, however, frequently justify elaborate equipment where efficiency alone will not. These conditions together with problems of temperature distribution, automatic control, etc., all require special engineering consideration confined to the particular application on hand. This paper is directed principally toward the general charac-

K. B. Anderson

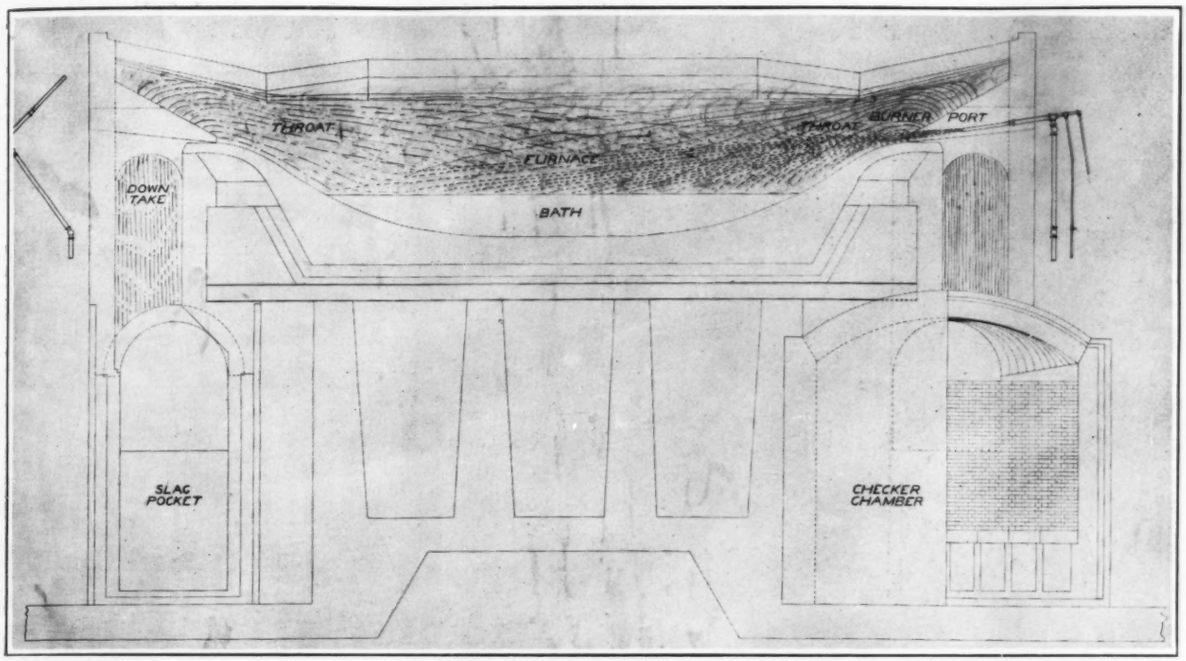

Fig. 2

Furnaces *to* Natural Gas

Manager
*Coast Industrial Gas Company**

teristics which have been found to exist in the application of natural gas to certain large furnaces.

In the open hearth furnace for the refinement of steel, we find one of the highest temperature operations for which fuel is used. In order to attain this temperature, air preheated to 1700-1800 degrees is necessary. Fig. 1 shows a diagram of a typical open hearth furnace burning oil as fuel, showing the path of the gases and the temperatures existing in various zones. The temperature in the furnace itself is limited principally by the ability of the refractories of which the roof is built to stand up. Since the absorption of heat by the bath is the objective, every effort is directed toward factors which increase the heat transfer from the flame to the bath without overheating the roof. Heat is transferred by radiation and by convection; radiation depends upon the temperature and depth of the radiating body and upon its distance from the absorbing surface, as well as upon the radiating qualities or emissivity of the radiating body. Convection depends upon the difference in temperature of the bodies and the intimacy of contact. In the case of a hot gas the velocity or scrubbing action of the heating medium against the absorbing surface is a governing factor. In the case of an open hearth furnace burning oil, the flame is created by the contact of atomized oil introduced from one end of the furnace with the preheated air from the regenerators. The oil being divided into relatively large particles, becomes heated to incandescence before the oxygen in the air has been able to chemically combine with the carbon. The result is a highly luminous flame whose direction and shape can be controlled by the direction and manner of injecting the oil into the furnace. In the case of natural gas it is found that, unless admitted slowly, the gas, being composed of molecular particles of combined hydrogen and carbon, intermixes rapidly by reason of turbulence with the oxygen of the preheated air and burns rapidly with a relatively transparent flame which delivers its heat indiscriminately to any surface exposed to it. If admitted slowly without turbulence the gas is cracked into H_2 and C, and carbon becomes heated to incandescence before combustion is complete, resulting in a flame as high in radiating qualities as the oil but lacking because of its low velocity, control of shape and direction.

The control of flame shape and direction must then be provided by the preheated air stream. Fig. 2 shows how the natural gas open hearth furnace is designed to impart to the air stream the velocity and distribution which causes the gas to be burned in a heavy luminous flame in direct contact with the metal bath, while the roof is protected by a blanket of air stratified over the flame. The design of the furnace to provide the desired flow of air and flame is empirical although it is guided by much the same principles that govern the streamline flow of fluids in conduits. It has been found that the best results are obtained when the velocities of the gases approximate 10 feet per second in the throat

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*Presented before the Pacific Coast Gas Association Commercial Section Conference, Los Angeles, March 16, 1933.

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Bakers of U. S. and Canada will learn how to compound cakes "like mother used to make" in a special 10-day intensive course, the set up for which is shown here.

Gas Equipment *for* Bakers' School

USING the most modern gas-fired baking appliances, the General Mills, Inc., Cake School, to be held in San Francisco from June 5 to 14, inclusive, will instruct bakers from over the entire United States, Hawaii and Canada, in the art of making cakes and sweet goods of a quality that will invite a greater public acceptance. It is estimated that professional bakers now have only approximately 20 per cent of the public trade in cakes, due to the fact that the baker's cake has thus far been lacking in the high quality of the domestic product.

In an effort, then, to show the baker how to make a cake that the public will buy, this intensive 10-day course will be conducted under the sponsorship of the General Mills, Inc., and Sperry Flour Co. Space for the school has been prepared on the ground floor of the Pacific Gas and Electric Co.'s old garage at Fifth and Howard Streets, San Francisco. Attractive display space has been arranged, and partitions constructed to provide for four separate baking shops, all equipped with the very latest in mixing and baking equipment.

The first eight days of the course will be devoted to the production of cakes, four hours of each day to be spent in actual shop work. This will be more than a mere demonstration, as the bakers will mix the ingredients and bake them off in the gas ovens just as in their own shops. Classes are to be organized exactly as in a conventional college, with 50-minute periods and 10-minute intervals.

The balance of the day will be spent in lectures on ingredients such as sugar, shortening, flour, eggs, leavening agents and flavors. Lectures will treat also mixing methods as applied to the particular cake being made, icings and decorating, and coffee cakes, pies, cookies and sweet goods.

Out of the four cake ovens to be used in the actual school work, three are gas fired, the selection having been made because of the increasing acceptance of gas fuel by bakers, due principally to its economy and factor of constant temperature. Temperatures on all the ovens are automatically controlled.

Sales-Institutional Appeal Keynotes Oklahoma Natural's Windows

By GEORGE GOODALE
Oklahoma Natural Gas Corporation

PARTICULAR persons are at times perplexed as to what to wear if they are to be identified as well dressed individuals. It is also difficult—only more so—for the advertising man to consistently keep his display windows in the "well dressed" category.

George Goodale

The utility merchandising ban in Oklahoma adds to the difficulty of producing successful window displays.

The Oklahoma Natural Gas Corporation, because of the necessity for curtailed expenditures, employs no window dresser, and the responsibility of windows rests with the advertising department. Many plans have been tried and at present the company is using a combination sales-institutional window display program. This will continue for the remainder of 1933 when it is likely that a different procedure may be adopted.

Oklahoma Natural has in use 13 displays, 12 of them making the rounds of the district offices and the other permanent in one Tulsa window. The No. 13, the last display installed, is believed to be something different in windows.

Acting upon the theory, and saying so in the display, that "Oklahoma Natural Gas Corp. service is as constant as the day's news," the set is based on current news. With a black background and a lighthouse in the foreground which flashes the words "Today's News Flashes," the set has attracted much attention and is a real service for passersby and those who wait for busses. A large clock gives the correct time. On the opposite side of the window is a weekly recording temperature clock. Beneath the temperature clock is a space for average temperature a year ago on the same date. Beneath the time clock is the current Oklahoma Natural newspaper advertisement.

Between the two clocks is a service of Illustrated Current News, which is the latest in news pictures and is changed three times daily. Below the pictures is space for any message the company chooses to offer. This is changed once each week, using interchangeable letters.

The window is seen by hundreds daily and is observed carefully. A set of displays featuring house heating, refrigeration, ranges and hot water was purchased from the American Gas Association as the inaugural of the window display program. These displays, supplemented with three that were designed and constructed locally, are in rotation among the district offices. At other times combinations of the A.G.A. sets have been used for special windows in the Tulsa office.

One display, which features the transportation of natural gas from well to consumer, and showing the system map,

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has been given favorable comment while another is particularly timely for Oklahoma this year. It is a pioneer window, featuring a historical map of Oklahoma prepared by H. Z. Sanders, company draftsman, with cutouts of a pioneer, gun in arm, and an Indian, arms outstretched in welcome. The theme about which the display is built is that Oklahoma Natural Gas Corp. is the pioneer in the development of natural gas in Oklahoma.

Since the latter window has been in use the demand for the historical maps, which were prepared by the company as an historical feature and for marking of highways, has increased greatly, and several thousand copies have been distributed.

The third addition was the adaptation of the Tulsa Christmas window into a modernistic set, stressing the value of modern gas appliances over antiquated ones.

One window which directly sold a furnace priced at more than $500 was a combination of two A.G.A. sets. One side was of a living room, with a man seated reading and his wife standing by the wall thermostat, regulating the temperature. The other half was part of a basement set and revealed the furnace. "Tending furnace the gas way," was the caption.

A combination was also used when all Tulsa firms ran window displays for the local community fund campaign. One half was of a well-heated and comfortable living room, with dad reading and a small girl playing with her doll. The other was an exterior view, with a family of four huddling close to a brick wall, ragged and apparently hungry. Snow was on the ground and the caption "You can" was over the interior view and "help him" over the exterior.

A Thanksgiving day window naturally featured a modern range, the home service department and a football game.

Each display stays in a window for one month. At the conclusion each district manager ships his display by truck to the next point, and receives in turn his new display from the preceding point. The managers follow a schedule prepared by the advertising department in Tulsa and there has been no confusion since the displays started on their round trip journey. When they have made the circuit, they return to Tulsa where they are dismantled and the materials, if possible, saved for future use. The first display which left the Tulsa office will not return until the first of January, 1934. All displays were sent out simultaneously and will touch every district office before they are "at liberty."

One of Oklahoma Natural's educational window displays.

Special displays to fit special occasions are made, but only in cases where they are particularly valuable, because of the need for economy in display costs.

Minnesota Northern Power Co.'s "Four Aces" Campaign

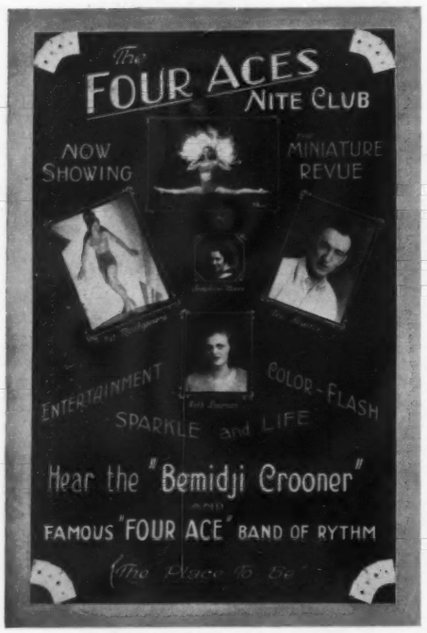
FOR its spring sales theme the Minnesota Northern Power Co. has selected the good old American game of Poker, and A. E. Schwarz, commercial manager of the company, gives *Western Gas* the details of a mammoth game of "5-card draw" which is now in progress among Minnesota Northern's salesmen.

This spring sales activity goes under the name of the "Four Aces" Campaign, and has been set up to offer customer appeal as well as extra stimulus and sales inducement to the company staff. The "Four Aces" represent four leading lines of company service equipment—ranges, refrigerators, house heating furnaces, hot water heating.

A prospectus was built featuring one number in each appliance line as the "Ace," on which a special price offer was made. Customers were offered a "New Deal," and advertising copy for use in 70 newspapers was set against playing card backgrounds.

The campaign was dramatically announced to the sales force at the Annual Spring Sales Conference, held at the Jordan Hotel, Glendive, Montana. Salesmen arriving from various districts throughout Montana, Wyoming and the Dakotas received a program of the conference as they registered at the hotel, and also a ticket to the "Four Aces Nite Club", which served as the finale to the conference. During the two-day meeting each "Ace" appliance was spectacularly introduced to the salesmen in a floodlighted shadow box, lined with gold metal cloth.

. . SALES PROMOTION DIGEST . .



The "Four Aces Nite Club" was staged in a rented club, and gave the sales campaign a good send-off, with 21 numbers making up an elaborate program. It was announced in advance by attractive posters, as illustrated above.

The meeting proper ended with the explanation of the "Poker Game Contest," and adjourned to an evening in the "Four Aces Nite Club." This entertainment spectacle was staged after the fashion of a genuine night club, and the club in which it was held had been taken over for the evening by the Minnesota Northern new business department. Decorations, costumes and specialty numbers again featured the "Four Aces," 21 numbers making up an elaborate program.

For the poker contest, in which every salesman was arrayed against the rest of his staff members, a complete system of points was worked out, the general idea being to give those making greater sales accomplishment a correspondingly greater chance to draw winning hands.

A master list of numbers from 1 to 1000 was prepared and each number was assigned a playing card value, so that each set of 52 numbers contained all the cards in a standard deck but with no two groups of 52 numbers represented by the same cards. Packages of 30 poker chips were issued to each salesman at the start of the campaign. Additional chips are available from the company's Minneapolis headquarters, in packages of 12 each, but these are not issued until the first 30 chips are used up.

As sales are made the workers earn the right to send in chips to headquarters, the chips entitling them to have cards drawn in keeping with this scale: Blue chips may be sent in on sales of $300 or more and are good for a five card draw; red chips may be sent in for sales of $200 or more and are good for a two card draw; white chips are sent in for sales less than $200 and are good for only one card.

"Sales Bull," the new business departments regular bulletin, is being issued in four-page form during the campaign, each page simulating one of the "Aces" in the pack. Numbers issued for the chips sent in by each salesman, and the corresponding cards, are published weekly in the "Sales Bull." At the end of each month of the three-month campaign, salesmen submit five cards from their month's numbers, as their best hand, and those holding the 10 best hands are in line for cash prizes. At the end of the campaign another award of cash prizes will be made for the 10 best hands of the campaign, using all the cards issued.

A NEW DEAL!!
Imagine a game where all your cards are winning cards. Well here's a deal where you simply can't lose: all the cards are aces. We've taken three of the really outstanding bargains in the gas appliance field and priced them so low that no one can afford to keep old fashioned equipment. If, like so many of us, you are forced to practice strict economy, consider this: No matter how reduced your 1933 income may be you need Natural Gas appliances . . . because they save.
A new Magic Chef Gas Range with 12 outstanding features including the Lorain Oven Heat Regulator . . . . (cash) $54.50
The latest model Standard Hot Water Heater, electrically welded with internal pipes of copper . . . . . (cash) $23.00
A Conversion Burner . . . converts your present furnace into a modern gas fired heating plant . . . . . (cash) $26.95
Convenient terms can be arranged if you wish.
MONTANA-DAKOTA POWER CO.

Newspaper advertising supported the campaign, copy featuring the "new deal" running in newspapers throughout the company's sales territory.

Prize money is raised by setting aside one-half of one per cent of the gross sales as a "jock pot."

The poker theme has been carried out in many ways in connection with the contest. Official rules are duly set forth giving values of hands. A history of playing cards is also being published in "Sales Bull," in supplements, during the campaign.

Chips are pouring into Minnesota Northern general offices, says Mr. Schwarz, and there is already good evidence in the form of signed sales contracts that a good poker game now and then is an asset to the sales program.

Gas Range Market Characteristics

SOME challenging facts on the present gas range market were introduced in an address to the Southern Gas Association's annual convention in Washington, D. C., held early in May, by John A. Fry, vice-president of the Detroit Michigan Stove Co. Mr. Fry, as chairman of the National Advertising Committee of the A.G.A. Manufacturers' Section, has supervised an intensive study into characteristics of the range market. The following brief quotations from his remarks condense some exceedingly important facts under this head:

John A. Fry

"We found that of the 15,850,000 gas ranges in use, over 12,000,000 of them are of an old, obsolete type with none of the modern conveniences that exist on the gas range of today. We discovered, for example, in a general average, that 8 per cent of the domestic gas ranges in use today are less than 1 year old; that 6 per cent are from 1 to 2 years old; that 8 per cent are from 2 to 3 years old; that 10 per cent are from 3 to 4 years old; that 68 per cent are over 4 years old."

"Isn't it amazing to learn that 78 per cent of the total gas ranges in use today

. . SALES PROMOTION DIGEST . .

are more than 3 years old, especially in view of the many developments that have been made in gas ranges in the past three years?"

"Is it any wonder, when this condition exists, that the gas industry should be concerned about its future growth and the growth of competition? It is not true that we are wide open and inviting intrusion into our market of any competitive cooking equipment and fuel?"

Mr. Fry offered the following evidence that raising prices should stimulate range sales:

"Let me relate to you the results of a survey which was made among nearly all the good dealers in this country—2,317 of our largest and best stores. We asked these dealers some very pertinent questions in relation to certain specific phases of our program, and two of the questions dealt exclusively with price. When asked what effect they though a very slight increase in consumer price would have on gas range sales, out of the total of 2,317—88 per cent of these dealers said that to increase prices would have no effect on sales. But nearly 40 per cent of the 88 per cent stated specifically that to raise gas range prices would increase sales. In addition, these 2,317 key dealers were asked if they would object to manufacturers raising prices still further to permit them to merchandise their products individually. Seventy-nine per cent of the total agreed that this would be not only permissible but advisable."

"A study has been in progress for many months, among 1,500 leading department stores located in important shopping centers throughout the country, to determine the price trends of gas range purchases by three price classifications: low, medium and high. So far, this has disclosed some very interesting information and conclusively proved a point—that is, that the sale of the higher priced class of merchandise—from $75 on up—is growing rapidly. However, there is a variation among some stores in relation to this particular point. While the majority of stores do sell in greater volume a higher priced class of merchandise—that is, fully equipped—there are a number who tore down our average seriously. In checking back among these institutions, it was found that the stores having a greater sales volume of high-priced merchandise are those stores that are selling gas ranges on the basis of convenience, beauty of design, economy of operation, and the many time-saving qualities of the modern gas range, while the stores selling strictly on a price basis are moving practically only the lower priced equipment. This has been proved true in case after case over the country."

Gas Appliance Society's billboard for May-June, 1933. More than 200 of these posterboards are being used throughout Northern and Central California with splendid results.

2000 Ranges Sold *in* Gas Appliance Society's Annual Campaign Week

By JEAN SCOTT FRICKELTON

Campaign Director, Gas Appliance Society of California

ESTABLISHING the fact that the gas appliance business is on the uptrend, results of "Gas Range Week" (May 1 to 6) now being tabulated by the Gas Appliance Society of California set a new all-time record for sales for this annual business-building drive. Although complete figures from some of the smaller communities are still missing, the initial sales tally, which comprises a check-up of the major cities and towns of Northern and Central California, indicates that more than 2,000 gas ranges were sold during the week. A very accurate count of "sticker" sales under the Society's plan of a sticker tax on each range sold in the territory, serves to confirm the sales totals reported by the dealers.

Not only were all previous sales records broken, but the week was particularly significant from the standpoint of healthy merchandising conditions in this territory in that the average unit price was the highest yet attained.

This new high unit price level was attained in part because of the foresight of the Gas Range Week Committee in raising the price limits on which the free campaign offer would apply, from $116 as established last year to $125 this year. Most of the ranges sold during the week were even higher than $125.

Advertising and publicity for the week greatly exceeded that of any previous year. It is interesting to note that those dealers who tied-in with the week most actively with individual store advertising and promotion were the ones who reported the greatest sales.

The special offer for the week was again the giving away of a $16 oven heat control on every kitchen heater type gas range regularly selling at $125 or more and on straight gas types of ranges regularly selling at $96 or more. The cost of the thermostat was divided between the dealer and the manufacturer.

Two thousand window and floor display cards were distributed to dealers throughout the territory and a free mat and publicity service was supplied both

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The Effect of

Connecting Rod Angularity *in* Double-Acting Gas Engines

By GROVE LAWRENCE

*Southern California Gas Company**

THE purpose of this paper is to discuss the effect of connecting rod angularity upon the valve timing, and consequently the operation, of double-acting gas engines. A double-acting unit, of course, is the reciprocating type in which there is a combustion chamber on each side of the power piston, and impulses are applied on both inward and outward strokes. This arrangement is similar to that of the simple steam engine of the slide valve type. By "angularity" is meant the angle between the connecting rod, and a line through the center of the crankshaft.

The usual reference for setting the valve and ignition timing on these engines is a set of graduations on the circumference of the flywheel. It is customary to graduate the face of the wheel in degrees, with the zero mark so placed as to come opposite a reference point when the machine is on dead center. When this system is used the various events are recorded as occurring so many degrees of flywheel rotation before and after dead center.

Then, if the correct timing for the outboard inlet valve causes it to open when the flywheel is in a position 30 degrees ahead of outer dead center, it might be expected that the correct inboard inlet valve setting would cause it to open 30 degrees ahead of inner dead center. The corresponding flywheel marking then opposite the reference point would be 180 degrees minus 30 degrees or 150 degrees.

It must be noticed that the flywheel position is used only as a reference for convenience. The important relation is that between the valve timing and the piston position.

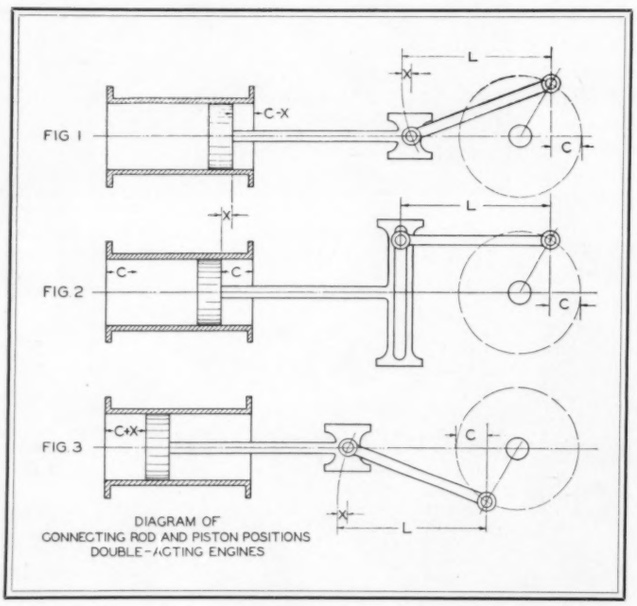

Diagram of connecting rod and piston positions—double acting engines.

However, equal flywheel settings will cause events to occur at equal piston positions only in about three *special* cases. These cases include, first, when the connecting rod is infinitely long; second, when all events occur exactly at dead center; and third, when the construction of the main crosshead permits the connecting rod to remain parallel to a line through the axis of the crankshaft, during the entire cycle of events.

In all other cases, equal valve and ignition settings with respect to flywheel position cause unequal settings with respect to piston position, and the difference increases with the angular distance from dead center. The inequality is due to connecting rod angularity.

The accompanying diagram shows how the positions of the connecting rod affect the relation between flywheel rotation and piston position. The figures show the connecting rod, crosshead, pistons, and cylinder of a double-acting engine.

In Fig. 1 and Fig. 2 the crank (or flywheel) is 60 degrees ahead of inner dead center, and in the lower figure it is 60 degrees ahead of outer dead center, assuming clockwise rotation.

Fig. 2 represents the third special case mentioned above, because the crosshead has been stretched out to permit the connecting rod to remain horizontal throughout the cycle. It can be seen that at all times the distance from the end of the stroke to the face of the piston equals the distance from the crank pin center projected on the horizontal axis, to the crank circle (C). At all times, therefore, the motion of the piston is truly sinusoidal. The clearances are then equal for equal flywheel positions, assuming symmetrical combustion chambers.

Fig. 1 shows the corresponding clearances on the inboard end for the same flywheel position (60 degrees), but with standard type crosshead. Note that dropping the end of the connecting rod from the horizontal position has *in effect* shortened the rod, thus reducing the clearance by the amount "X."

Similarly, in Fig. 3, raising the end of the rod has *in effect* shortened it, again moving the piston to the right, but this time increasing the clearance by the same amount (X).

It can be seen that the difference in clearance between the head and crank end becomes greater as the piston recedes from dead center. It decreases

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*Presented before the Pacific Coast Gas Association Technical Section Conference, held March 2 and 3, 1933, at Los Angeles, Calif.

Metal Spraying *in* Compressor Stations

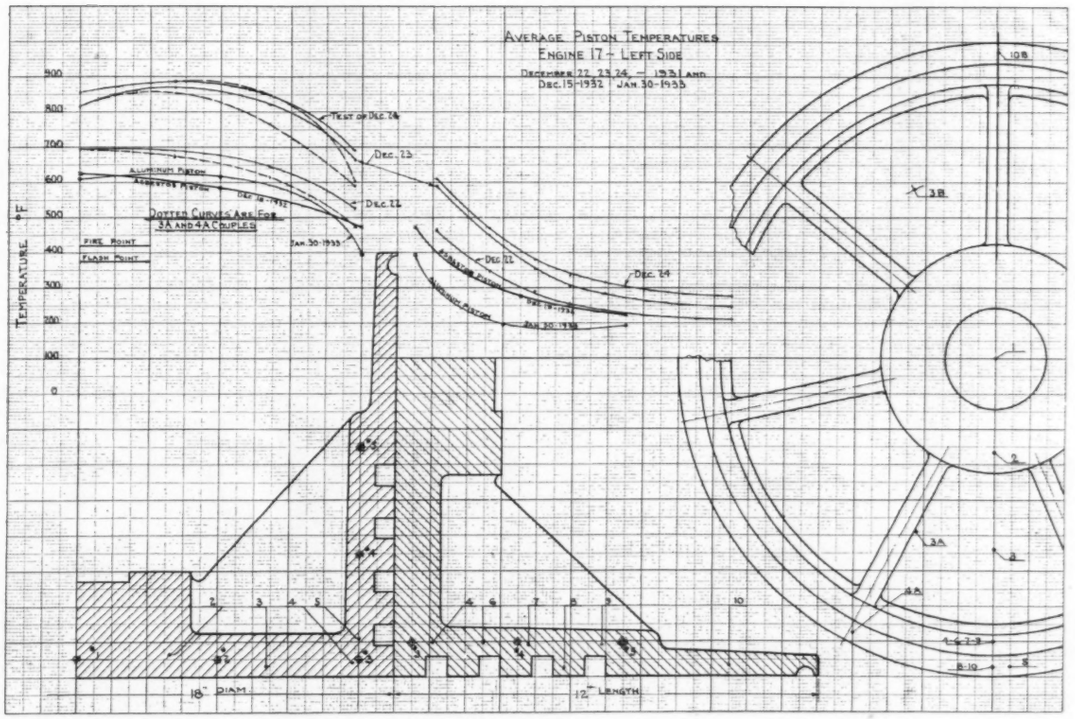

Fig. 1.

By B. E. EMBRY

*Southern California Gas Company**

METAL spraying is exactly what the name implies—the spraying of molten metal on practically any object such as glass, wood, steel, paper, cement, and various other substances. The metal so deposited has the same characteristics as the original metal. In other words, these metal coatings can be ground, machined, polished, or treated in practically any way that the parent metal itself can be treated.

The idea of spraying molten metal is not new, as metals have been sprayed with some degree of success for the past 30 years or more; but only recently has metal spraying been used very extensively in the United States. Patents covering some of the original apperati have expired, and the exceedingly high cost has since been appreciably lowered. A machine formerly cost as much as $4000, and even then was more or less experimental, while now the cost is about $500.

The success of metal spraying is dependent to a large extent upon the proper treatment of the material before the metal is applied. Porous materials such as plaster, cement, and wood, require no preparation other than the removal of all grease, oil or pitch. The non-porous articles such as glass, steel, iron, etc., require a preliminary sand blasting before coating. This forms minute indentations in the material so that the metal to be applied when in its molten form, can secure a good bond. As soon as the metal is sand-blasted it should be coated immediately, for if allowed to stand it will collect moisture and dust, and therefore impair the bond.

*Presented before the Pacific Coast Gas Association Technical Section Conference, held March 2 and 3, Los Angeles, Calif.

While the applications for metal spraying are many, this paper will deal only with uses for the process in compressor stations.

Metal spraying has already proved a success in the building up of worn piston rods and other parts that would have to be either re-turned to a different size or replaced with new parts. The importance of keeping all parts of a similar nature to one standard dimension, wherever possible, is generally recognized since the number of maintenance parts is thus reduced to a minimum, and it is believed that this process will, to a large degree, accomplish this end.

The gun of the present day is small and light, weighing only about three pounds. Its shape is very similar to a paint spray gun, and it is operated in much the same manner. The wire to be sprayed is fed through the gun by

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Change-Over Methods *at* Muscatine *and* Atlantic, Iowa

By R. F. GALPIN

Iowa Electric Company, Muscatine *

THIS discussion covers the natural gas conversion work in Muscatine and Atlantic, Iowa, both served by the Iowa Electric Co. The work at Muscatine was done first. Our method of conversion was the adaptation method rather than the screw-back method. After running numerous tests I was convinced that the combustion was better with the adaptation than with the screw-back method.

Our method of adaptation was to convert two top burners on a stove at the time the preliminary survey was made before natural gas was turned into the system. This method gives the customers the use of two burners for their speed work while the rest of the appliances are being converted. This has proven quite satisfactory to the majority of the customers. This method of conversion I believe to be new, having been tried first at Muscatine and later used at Atlantic. We found by this method that about 95 per cent of our preliminary adaptations were reasonably near correct, the other 5 per cent being generally a little too rich, not having quite enough air. Our method was to buy our adapters in one drill size, No. 60, and then ream and gauge them to the size necessary for the particular burner they were to be used on. After the city had been surveyed and the first two burners adapted, we made a list from our survey cards of the various appliances we would encounter later. In our small city of 18,000 we found that we had 150 different makes of ranges and 37 different makes of water-heaters.

When the above work was completed, we were ready to turn natural gas into the distribution system, which we did at 8:30 in the evening. We did not purge our lines of the artificial gas when this was done but allowed it to be drawn and used by the consumers. Twenty minutes after natural gas was turned into the system it had reached the business section and all-night restaurants. The last thing before turning natural gas into the system, we had taken from our survey cards the names and addresses of consumers with automatic, storage or pilot-operated water heaters. These were turned off by conversion men and service men between 6 and 7 o'clock of the evening that we turned gas on. We did this with our own men rather than leaving it to the householders, for fear they might forget it. We arranged, on the night gas was turned in, to have our conversion men take care of restaurants, hotels, hospitals and other public institutions during the night so that they would be ready to meet their demands the following morning. The next morning we organized a special water heater crew which did nothing but put water heaters back into service, the rest of the men working on ranges alone. We purposely passed all laundry equipment and side arm tank heaters with the idea of getting the ranges back into operation as soon as possible. At this time we checked the preliminary adjustment of the first two burners adapted. When this part of the work was completed we went over all other equipment, completing our conversion work in a little less than three weeks from the time gas was turned on with a crew of about 28 men.

The work in Atlantic was carried along very similar lines but with a smaller crew. In Muscatine we used five men to a crew with a crew captain supervising the other four men and working himself. In Atlantic we used all experienced men and did not have crew captains. Each man was assigned a given number of calls and a progress sheet was checked twice daily. When he had completed the preliminary adaptation and survey, the route of each man was changed. This resulted in one man checking the other man's work, which has proved successful in reducing the number of call backs. Each man knew that his work would be checked by another conversion man to whom credit would be given for any defects in workmanship or judgment that he discovered.

In my opinion liberal advertising of the proper sort will go a long way toward preparing the public mind as to just what to expect in conversion work of this kind and will also make the task of the conversion man much easier. We used the system of following our meter reading routes and tried to put a crew to work on each route so that when calls came into the office the customers would be told that a crew was working that route and that it would be but a short time until any trouble they were encountering would be corrected. They were also asked for their cooperation and patience to the end that we could serve them with as little delay and inconvenience as possible.

*Presented before the 12th Annual Gas Meter School and Conference, sponsored jointly by the Mid-West Gas Association and the Iowa State College Engineering and Extension service.

2000 Ranges Sold

(Continued from Page 15)

to dealers and newspapers. In addition to the window and floor display cards featuring the special offer, the Society sent out other floor display cards to dealers having display frames in which to show them.

The Society's spring billboard campaign was timed to start on the opening day of "Gas Range Week", with 210 large poster boards in cities, towns and along the highway from Bakersfield in the south to the Oregon line.

The State Society offered street car dash board cards to any units desiring to pay for the space. The San Francisco Unit availed itself of this offer and nearly 200 street cars carried the message of "Save $16 on gas ranges this week only" throughout the city.

The State Society also cooperated with the San Francisco Unit in arranging a children's essay contest through "Mother Hubbard" of The San Francisco News. Cash prizes were offered and as a result hundreds of children throughout the Bay Region sent in essays and drawings on gas ranges. Some schools participated in the contest as a group, and as a result many excellent contributions were received. Since the children had to visit the retail stores to secure literature and information and since in most cases they were accompanied by parents, it was felt that this feature produced far-reaching results.

Those participating in this year's Gas Range Week are enthusiastic over the results achieved, and many comments have come into Society headquarters from leading dealers who call attention to gains in sales volume and unit sales prices of ranges sold. Increase in sales for many was in excess of 50 per cent over the campaign of last year.

Pacific Coast Gas Association

Managing Director: Clifford Johnstone
Association Headquarters:
447 Sutter Street, San Francisco

President: H. L. Masser
Vice-President and Executive Engineer,
Los Angeles Gas and Electric Corp.

Discussion Sessions to Feature Seattle Conference

THE Northwest Conference of the Pacific Coast Gas Association to be held at the Olympic Hotel in Seattle, June 22 and 23, will be unique in that no set papers will appear on the program. Instead a number of the most pressing problems now facing the gas industry have been selected and each of these will be introduced by someone familiar with the problem, following which everyone present will be given an opportunity to express his experience and views.

The Conference will be called to order promptly at 9:30 A.M., June 22, by President H. L. Masser. The first session will be devoted to the discussion of load building and a description of several plans which have achieved results. The second session on the afternoon of June 22 will be devoted to a discussion of appliance marketing, consideration being given to the problems of both utilities and dealers. The third session on the morning of June 23 will be given over to the engineers and the Production Committee of the Technical Section under the chairmanship of C. P. Johnson of Bellingham, will render its final report for the year. A feature of this session will be a report on natural gas prospects in the state of Washington prepared by Dr. Harold E. Culver, Supervisor of the state's Division of Geology.

The afternoon session on June 23 will be devoted to a discussion of competition as it affects the sale of gas in the Northwest states. Electric competition perhaps had its origin in these states but has now become a national problem. The American Gas Association has been making a study of some aspects of electric competition through a body known as the National Directing Committee of Executives which will make its first report to the American Gas Association's Executive Board at a meeting held in Chicago on June 2. The results of this meeting and the plans formed there will be reported to the Conference by F. S. Wade, the Pacific Coast member of the Executive Committee. Also in this session R. N. Dreiman, Chairman of the Association's Accounting Section, will open a discussion of the problems of making collections during depression times.

On Friday afternoon the visiting ladies will be entertained by Mrs. Pollard with a luncheon at the Broadmoor Golf and Country Club, followed by a drive through the beautiful Lake Washington district. The Conference will close Friday night with a banquet and entertainment held in the Junior Ballroom of the Olympic Hotel.

All arrangements are under the leadership of Jas. F. Pollard, vice president and general manager of the Seattle Gas Company, who is being assisted by the following committees:

Program: Jas. F. Pollard, Chairman, W. I. Battin, J. Earl Jones.

Entertainment: Leighton Steele, Chairman, Walter Alexander, Ruth Hopkins, Beatrice Strege.

Ladies Entertainment: Mrs. Pollard, Hostess, assisted by Mrs. Battin, Mrs. Dunbar and Mrs. Jones.

Transportation: George Stuart, Chairman, "Spike" Davis, Wally Smith.

Registration: Norbert O. Fratt, Chairman, Ray Alexander, S. De Lancey.

Banquet: Ray Trowbridge, P. R. Dunbar.

The program in some detail follows:

Thursday Morning, June 22

Discussion: *Aids to Load Building*

Inducement Rates and Budget Plans—Led by Jas. F. Pollard, vice-president and General Manager, Seattle Gas Co.

The Rental of Appliances—Led by C. B. Babcock, President, C. B. Babcock Co.

Free Installations and Free Appliances—Led by John Keillor, Gas Engineer, British Columbia Electric Power and Gas Co.

Prepayment Meters—Led by W. D. Dickey, Manager, Pacific Meter Works.

Advertising—Led by J. Chas. Jordan, Assistant Manager Advertising Department, Pacific Gas and Electric Co.

Thursday Afternoon, June 22

Discussion: *Appliance Selling*

Selling Appeal Through Club Luncheons—Led by Beatrice Strege, Home Service Director, Seattle Gas Co.

Collections and Repossessions—Led by Norbert O. Fratt, Credit Manager, Seattle Gas Co.

Employee Selling—Led by R. W. Coblentz, Commercial Manager, Washington Gas and Electric Co.

Artificial Obstacles to Selling Imposed by Regulation—Led by H. M. Thomas, General Manager, Northwest Cities Gas Co.

Dealer Cooperation—Led by J. Earl Jones, Commercial Manager, Seattle Gas Co.

Friday Morning, June 23

Meeting of Technical Section

Chemical Laboratory Methods: Report of Chemical Committee—J. M. North, Chairman, Los Angeles Gas and Electric Corp.

Making Repairs to Water Seal Gas Storage Holders: Report of Holder Maintenance Committee—T. N. Kellett, Chairman, Los Angeles Gas and Electric Corp.

Tar Disposal: Report of By-Products Committee—W. H. Wattenberger, Chairman, Washington Gas and Electric Co.

Prospecting for Natural Gas in Washington—Dr. Harold E. Culver, Supervisor Division of Geology, Department of Conservation and Development, State of Washington.

Operating Problems—A Symposium conducted by R. A. Hoffman, Assistant Superintendent, Spokane Gas and Fuel Co.

Friday Afternoon, June 23

Discussion: *Competition*

Building and Holding the House Heating Load under Present Conditions—Led by Ray Trowbridge, Industrial Engineer, Seattle Gas Co.

Domestic Competition—Led by Jas. I. Stone, Vice President and General Manager, Spokane Gas and Fuel Co.

The Program of the National Directing Committee of Executives—F. S. Wade, President, Southern Counties Gas Co.

Collection Methods in Depression Times—R. N. Dreiman, General Auditor, Coast Counties Gas and Electric Co.

Committee Reports Are Due June 15

Chairmen of Association committees are burning the midnight oil in an effort to complete reports which have been called for by June 15. They have been asked to prepare at least 25 copies of their reports so that these can be circulated among interested members prior to the Convention in order that as many men as possible be prepared to discuss them when they are presented. This has been made necessary because only a few of the most complete and valuable reports will be printed this year in the pre-convention number of *Western Gas*.

Commercial-Industrial Sales Gain on Coast

COMPARATIVE figures on the operation of gas companies of the Pacific Coast for the first quarter of 1933 as compared with a similar period for 1932, were released late in May by the Pacific Coast Gas Association.

In this report the gas sold for use in steam plants for the generation of electricity has been segregated. Operation of steam electric generating plants varies so greatly because of water supply conditions that the inclusion of this figure in the totals for commercial and industrial sales has distorted these totals. Commercial and industrial cubic feet sales in California increased 7.6 per cent for the period, and the increase for the whole area was 6.6 per cent in this classification. If the gas used in steam electric plants had been included in these totals a decrease of 2.8 per cent would have been indicated.

GAS COMPANY OPERATIONS FOR THE STATES OF CALIFORNIA, ARIZONA, NEVADA, OREGON AND WASHINGTON AND THE PROVINCE OF BRITISH COLUMBIA

First three months of 1933 compared with similar period in 1932

	1932	1933	Per Cent Change
Production—Mc.f			
Water Gas	866,703	706,563	
Coal Gas	413,209	288,504	
Oil Gas	2,481,778	1,369,054	
Coke Oven Gas	178,315	322,603	
Butane Gas—550 B.t.u.	90,017	79,487	
Natural Gas Purchased	40,790,315	41,861,886	
Total	44,820,337	44,628,097	— 0.4%
Active Meters—March 31			
Domestic	1,555,135	1,519,632	— 2.3%
Commercial and Industrial	71,847	71,440	— 0.6%
Total	1,626,982	1,591,072	— 2.2%
Sales—Mc.f.			
Domestic	23,527,010	22,444,759	— 4.6%
Commercial and Industrial	11,798,405	12,586,908	+ 6.6%
Steam-Electric Generation	4,575,137	3,279,450	—28.3%
Total	39,900,552	38,311,117	— 4.0%
Gross Revenue			
Domestic	21,079,799	20,196,232	— 3.2%
Commercial and Industrial	3,948,133	3,926,061	— 0.6%
Steam-Electric Generation	589,341	391,786	—33.6%
Total	25,617,273	24,514,079	— 4.3%
Miles of Main—March 31	25,292	26,045	
Number of Employees—March 31	11,203	11,329	

New Publications

THE following books and pamphlets have recently been added to the Association's library:

Transactions of The Institution of Gas Engineers of Great Britain. 1928-1929.

1933 Guide of the American Society of Heating and Ventilating Engineers.

A Calorimetric Method for Determining the Intrinsic Energy of a Gas as a Function of the Pressure—Research Paper No. 487 U. S. Bureau of Standards.

Installation of Foxboro Flow Meter using Pipe Connections. Foxboro Company.

Prone Pressure Handbook. A series of five pamphlets on Resuscitation and Asphyxiation. Published by the American Gas Association.

Deviation of Natural Gas from Boyle's Law. Technical Paper 539, U. S. Bureau of Mines.

The Synthesis, Purification and Certain Physical Constants of the Normal Hydrocarbons from Pentane to Dodecane, of n-Amyl Bromide and of n-Nonyl Bromide. Research Paper No. 482, U. S. Bureau of Standards.

Retail Distribution in California.—U. S. Census Report.

Manufacturers in California.—U. S. Census Report.

Pipe Coating and Corrosion.—Report on Inspection and Tests of Specimens Removed in 1932. Scott Ewing for American Gas Association.

Comparative Tests on Gas and Electric Kitchens in Two Welfare Association Cafeterias in Washington, D. C.—American Gas Association.

Air Conditioning—Proceedings of Conference held at University of California, February 9 and 10, 1933, under the auspices of A.S.M.E.

The Thomas Recording Calorimeter, Research Paper No. 519, U. S. Bureau of Standards.

Death Takes O. C. Bunster, Pioneer Gas Appliance Leader

The gas industry of California was shocked at the sudden death on May 15, of O. C. Bunster, president of the Sterling Furniture Co. in San Francisco, and for the past five years State president of the Gas Appliance Society of California.

To Mr. Bunster was credited much of the constructive work done by the Society in creating such harmonious relationship in Northern and Central California between utilities and dealers. As one of the leading merchants for many years, Mr. Bunster saw the need for closer cooperation, knowing that the success of one group was essential to the success of the other.

The broad policies established by him made possible the carrying on of many successful cooperative sales campaigns, directed by the Gas Appliance Society including "Gas Range Week," circulating heater campaigns and other business-building drives that never failed to achieve results with all branches of the industry working together in an understanding and harmonious manner.

Mr. Bunster was a native of Victoria and the son of the late O. C. Bunster, member of the Canadian Parliament. The family came to San Francisco about 35 years ago and Mr. Bunster, together with H. A. Saxe, organized the Sterling Furniture Co.

Court Upholds Los Angeles Gas Rate Reduction

The United States Supreme Court early in May upheld the order of the California Railroad Commission of 1930 which reduced rates charged by Los Angeles Gas and Electric Corp. of Los Angeles. This decision calls for refunds for the company's consumers aggregating about $3,000,000. Some idea of the magnitude of the task can be gained when it is understood that more than 10,000,000 gas bills will be re-figured and interest computed.

Under the new schedule the rate for the first 300 cubic feet remains 80 cents per 100; for the next 3,700 cubic feet, the rate in District 1, Los Angeles, Pasadena and adjacent areas, is cut from 72½ to 69 cents, and in District 2, embracing Inglewood, Culver City and adjacent areas, from 77 to 73 cents. For all over 4,000 cubic feet, the rate is reduced in District 1 from 72½ to 59 cents; in District 2 from 77 to 63 cents.

F. W. Crawford, Vice-Pres. Lone Star Gas Corp., Passes

F. W. Crawford, vice-president of the Lone Star Gas Corp., Pittsburgh, Pa. and Dallas, Texas, died at his home in Columbus, Ohio, on April 20, following a heart attack. He was a brother of J. B. Crawford, one of the founders of the company who died on March 5, and uncle of R. A. Crawford, vice-president of the Lone Star Gas Co.

The deceased was also vice-president of Columbia Gas and Electric Corp., and chairman of the boards of Federal Gas and Fuel Co., Columbus Gas and Fuel Co., Preston Oil Co., Northern Ohio Natural Gas Co., Edgewater Gas Co. of Toledo, Ohio, and the Indiana Gas Distributing Co., Columbus, Ohio.

Des Moines Gas Co. Changing to 800 B.t.u. Mixed Gas

Des Moines Gas Co., Des Moines, Iowa, is changing to 800 B.t.u. mixed natural and manufactured gas. The agreement to serve higher heat content gas is the result of recent rate schedule changes in Des Moines. The new gas will be turned into the mains about July 1.

Before changing over to the new gas, engineers of the company set up a demonstration of four gas ranges, each burning gas of different B. t. u. content. Three pounds of water were placed in a container on each range simultaneously, and it was proven as the water was heated to a certain temperature that the number of therms used was the same in each of the four cases, no matter what was the B. t. u. content of the gas.

The experiment was conducted in the presence of all employees of the company, by groups, and for various members of the city council and employees in the city departments. Recording meters for each gas range gave an accurate picture to those watching the demonstration.

1933 Calendar

June

American Gas Association—Chicago, Ill. Executive Conference, June 1-2, 1933.

Pacific Coast Gas Association—Northwest Conference, Olympic Hotel, Seattle, Wash., June 22-23, 1933.

Southern California Meter Association—Long Beach, Calif., June 22, 1933.

Public Utilities Advertising Association—Annual Convention, Grand Rapids, Mich., June 26-28, 1933.

American Society of Chemical Engineers—Annual Convention, Chicago, Ill., June 26-30, 1933.

September

Pacific Coast Gas Association—Annual Convention, Ambassador Hotel, Los Angeles, Calif., Sept. 13-15, 1933.

Canadian Gas Association—Annual Convention, Ottawa, Can., Sept. 18-19, 1933.

American Gas Association—15th Annual Convention and International Gas Conference, Chicago, Ill., week of Sept. 25, 1933.

Natural Gas Department, A.G.A.—Annual meeting, Chicago, Ill., Sept. 25, 1933.

October

American Petroleum Institute—14th Annual Meeting, Chicago, Ill., Oct. 24-26, 1933.

Kansas City Gas Co. in New Quarters

KANSAS CITY Gas Co., Kansas City, Mo., has moved into new quarters in the Scarritt Building, Ninth and Grand Ave., effective May 29.

One of the features of the new building is the model kitchen, separated from the sales floor by wing walls, where new gas appliances will be displayed, and where later on cooking demonstrations will be held. There will be a room to accommodate about 50 persons in the kitchen.

A model basement also will be featured in the new building, where the Surface Combustion Co.'s "Heatmaster" will be installed, for heating and air conditioning. An incinerator and an automatic gas-fired water heater are also a part of the basement equipment.

The information counter is constructed at the front of the sales floor, where an employee will be stationed at all times, and where small repair parts will be kept.

The windows of the lower floor have interesting treatment, with walnut backs with an open arch on each side. Italian marble wainscoting is used around the walls of the room, around the pillars in the center of the room, and in front of the cashier cages. The top part of the cashier cages is of grill work cast from white metal.

Off the sales floor is the customers' room, where customers may obtain any service desired. An acoustic ceiling is another feature of this room.

Offices of the claim, purchasing, paymaster's and accounting departments occupy the second and third floors of the building.

Denver Gas Sales League Goes Into Action

WITH the opening of the American baseball season, the Gas Sales League of the Public Service Company of Colorado, Denver, swung into action, under the direction of Roy G. Munroe, gas new business manager. The opening game was called on Tuesday morning, May 16, and is being followed by three games a week between eight mixed teams, four games being played simultaneously on each Tuesday, Thursday and Saturday. The chief difference between games of the Gas Sales League and the "big" league, is that in the former, sales orders are the hits, pens are the bats and "no orders" are the outs.

Accumulated orders from the two preceding days are the basis for each day's play. Sale of a gas range, manually operated water heater, or accumulated miscellaneous sales of $50 to $99 inclusively equal one base hit. Manual householeating job, fireplace heater, or miscellaneous sales of $100 to $199, inclusive, equal a two-bagger. Sale of a storage water heater, thermostatic conversion, or accumulated miscellaneous sales of $200 to $299, inclusive, equal a three base hit, and a gas designed job, circulating space heater, incinerator, etc., equal a home run. Progress from base to base is forced by succeeding hits. A man with no orders, or not present without previous excuse counts two outs. Batter gets three strikes called five seconds apart by the umpire after being called to the bat in which to take his position at home plate and announce his decision as to his play. At the end of three strikes he is called out by the umpire regardless of the number of hits which his slip may show. Each captain must file his batting order with the umpire by 9 a.m. of the day preceding the game.

The usual rules are in effect against throwing bottles, cushions, etc.

New Officers Inducted for 1933-34 Southern Gas Assn. Year

At the 25th Annual Convention of the Southern Gas Association held at Washington, D. C., May 2, 3, and 4, the following officers and directors were elected to serve for the coming year:

President: B. B. Ferguson, president, Portsmouth Gas Co., Portsmouth, Va.

First vice-president: E. S. Dickey, American Meter Co., Baltimore, Md.

Second vice-president: W. W. Winters, vice-president and general manager, Atlanta Gas Light Co., Atlanta, Ga.

Secretary-Treasurer: S. L. Drumm, engineer, New Orleans Public Service Inc., New Orleans, La.

Directors: C. B. Gamble, general manager, Birmingham Gas Co., Birmingham, Ala.; J. F. Orr, United Gas Public Service Co., Houston, Texas; W. L. Plummer, Atlanta, Ga.; C. M. Rogers, New Orleans Public Service Inc., New Orleans, La.; L. H. Hungate, Jr., industrial fuel engineer, Memphis Power & Light Co., Memphis, Tenn.; Edgar Morris, Washington, D. C.; C. L. Ridley, new business manager, Nashville Gas and Heating Co., Nashville, Tenn.; and W. S. Russell, Atlanta, Ga.

No announcement has been made as to where the next annual sessions will be held.

Bristol Co. Moves N. Y. Office to Downtown Location

The Bristol Co., Waterbury, Conn., maker of indicating, recording and controlling instruments, has announced that the New York office of the company will be located in the Daily News Building, 220 East 42nd St. Because of its central location this new office will enable the company more efficiently to serve its clientele throughout the metropolitan territory. C. W. Williamson, district manager, continues in charge, assisted by a staff of six application and service engineers.

MEASUREMENT and CONTROL

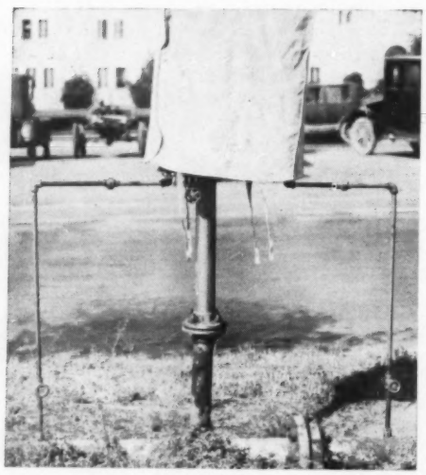


Fig. 1.

Unit Type Meter Houses

By GORDON GREENE
*Associated Oil Company**

THE importance of a cover for the protection of orifice meters has been a topic of discussion, both pro and con, for some time. There are many who believe that a house should cover the meter to protect it from rain, wind, and all other atmospheric conditions; and there are a few who contend that since most meters are air- or gas-tight when the door is shut, no cover is required, and that an occasional coat of paint keeps the meter in good shape without the additional investment of a meter house.

Gordon Greene

However, the houses used today have certain advantages that outweigh the opinions of those who are opposed to them. First of all, an orifice meter is a very valuable instrument; it furnishes the basis for the accounting of wet and dry gas revenues which are of considerable importance to the oil and gas industry. It is, in short, a cash register, recording each hour a certain volume which is equivalent to a definite sum of money. The importance of the daily records made by these meters is often overlooked, the desire to obtain a clean chart showing two distinct lines of static and differential pressures being the ultimate ambition. If the need for measurement is important enough to warrant installing a meter, the meter should have adequate attention to insure perfect recording. The gauge should have suitable housing which will protect it not only from changes in atmospheric conditions, but against tampering with chart or mercury chamber.

Recently there have been numerous reports of mercury being stolen from orifice meters in more or less isolated locations. The mercury in a number of cases was taken from meters without houses. However, the loss of mercury cannot be compared to the loss of record that occurs during the period meters are not recording.

The design of a meter house has been largely governed by the individual requirements in each installation. One company may use the bag type of cover (Fig. 1) with strings attached for tying it to the piping after changing chart. This bag will shed rain to a certain degree but offers no aid to the attendant on a rainy day. The bag can be very easily mislaid or carried off for other uses.

Fig. 2.

Another company will use the large galvanized iron houses (Fig. 2) which are bulky and cumbersome, but the contention in this case is that a meter when set on a line is a relatively permanent installation, and by the time the meter service is discontinued the meter house, if it cannot be moved readily, can be knocked down and junked with justification due to the length of time it had been in service. This type of house will protect the meter satisfactorily in unit installations in fields where appearances do not count. It is estimated that this type of house will cost approximately $15 to construct.

One major oil company operating absorption plants for the manufacture of natural gasoline, and having numerous orifice meters installed for measurement of natural gas to and from various leases, employs a galvanized sheet metal box (Fig. 3) with a convenient glass door for observation of the meter without the extra effort of opening and closing door to observe readings. This type is used mainly inside the gasoline plant where the operator can observe conditions of the plant and where speed and efficiency are essential. This type can be very easily lifted off the set-up for adjustment of the meter. A plain door is provided on the valve side for working on gauge without lifting the house.

The Southern California Gas Co. uses a similar type of house in its installations. Fig. 4 shows a unit installation in an isolated section where a recording thermometer, 50-inch orifice meter and a 10-inch meter are employed; all using the standard type of house mounted on a piece of 4-inch pipe with a heavy 6-inch upright for additional protection to meters. Piping around the meter is all uniform and is connected through a section of conduit to the vault below where

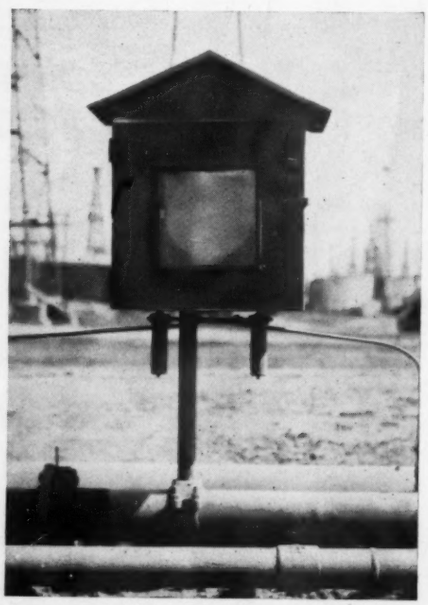


Fig. 3.

*Presented before the Southern California Meter Association, February 23, 1933.

orifice fittings and regulators are located. The conduit also acts as a ventilator for the vault. In the construction of the meter box facilities were provided to hold an extra supply of charts and also a tray for ink bottles. There is no bottom in the house where the accumulation of gas might take place. A coating of aluminum paint protects the en tire installation from the elements.

Fig. 5 illustrates a hook-up with a clock meter installed on the flange connections.

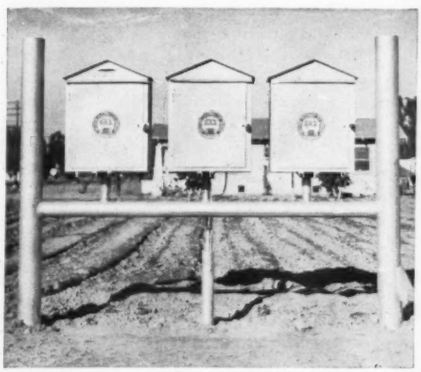


Fig. 4.

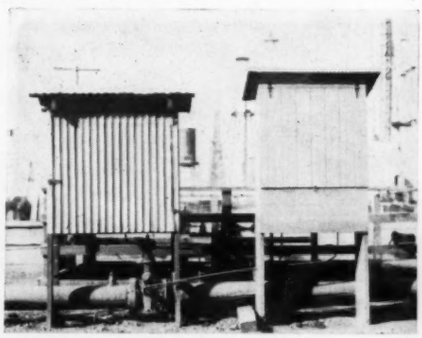


Fig. 5.

In this case the meters are on a lease measuring wet gas and will be in service as long as gas is produced from the wells. Therefore, meter houses of a more permanent design are being used. A little more thought as to location of houses in relation to orifice fittings would facilitate changing of orifice plates. The house to the right is constructed entirely of wood and has large doors on both sides that swing up and can be fastened in the raised position so as to protect the metermen, as well as insure a dry chart on rainy days. A piece of 2- x 12- x 3-inch timber, with a short length of 2-inch pipe bolted to it is located inside house for mounting the meters. This type of house gives excellent protection to the gauge. Due to its size it is not easily transported but is suitable for permanent installation.

A group of sheet metal type boxes shown in Fig. 6 are located at a compressor plant for measuring dry gas which is recirculated in a group of wells. In this case the houses or iron boxes are all facing the wrong direction. The boxes should all be lined up to face the compressor plant and have glass in the doors for quick inspection by the operator. Valuable time is lost after starting up a compressor in opening doors to find out

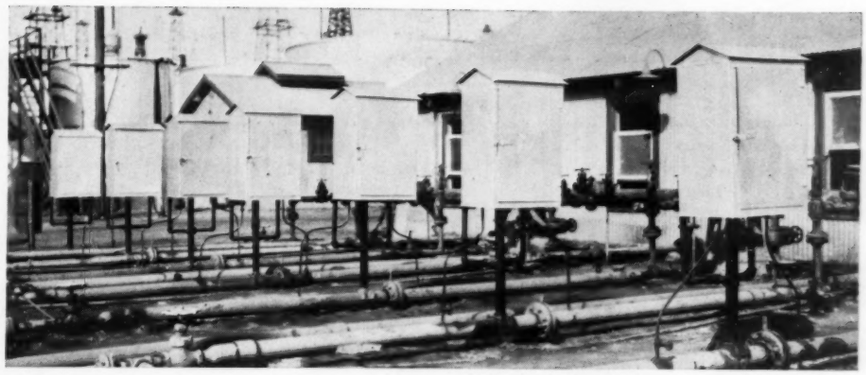


Fig. 6.

differential readings, whereas, if the meters were facing the plant the operator could stand at the valve controlling the intake and watch the chart until the desired amount of gas was passing.

The meter runs are balanced on blocks and have a tendency to sway on a windy day. They should be anchored down on concrete and be rigid enough to overcome any outward movement. A walk constructed so as not to come in contact with the runs is advisable. The meters must be installed correctly if accurate measurement is to be obtained. One trouble with this type of box is the bracket arrangement holding the box to the meter stand. A considerable extra weight is added to the set-up. No provision is made for chart or ink and very little space is available inside to make adjustments to meter.

There is quite an assortment of types of meter houses in use and some seem quite odd as to design. For example, Fig. 7 shows a Foxboro gauge with a sheet metal covering which encloses just the upper half. The front part of the covering is hinged to swing up, out of the way of all the piping, and fittings are exposed. About the only protection afforded is to shed rain from mercury pots.

One of the major oil companies operating in the Ventura field has success with a sheet metal box (Fig. 8).

In the mid-continent field weather conditions are such that many different types of meter housings are necessary. A few of the larger gas companies build brick or stucco houses especially for multiple installations. Some resort to frame and sheet iron con-

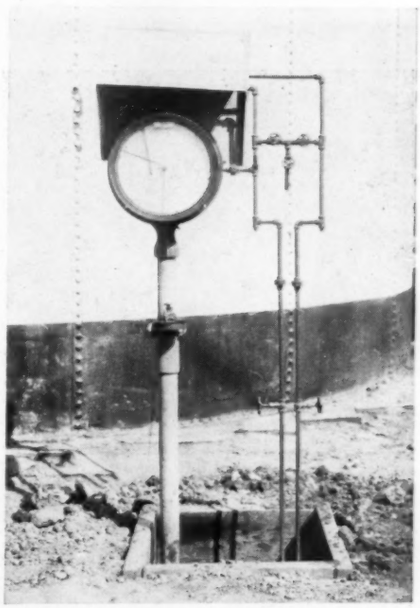


Fig. 7.

structed houses to afford more protection in the winter time to metermen adjusting the meters and changing charts. However, there are several types of galvanized iron meter boxes similar to the ones used in California. About the most practical type is the one used by a large gas company of Oklahoma. This is made with riveted metal around a wooden frame, opening in the front and in the rear; it is set directly over the orifice flange.

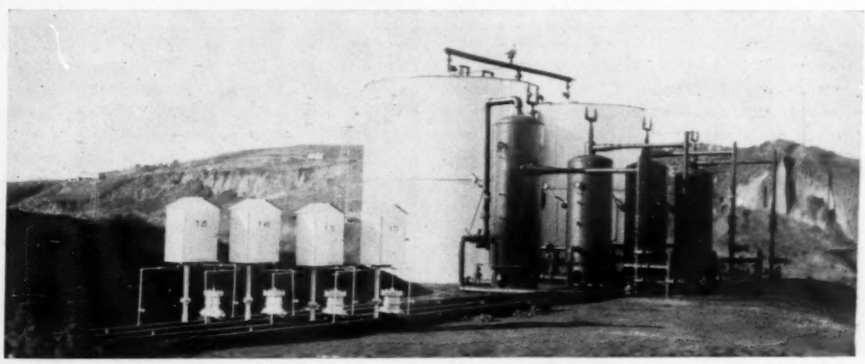


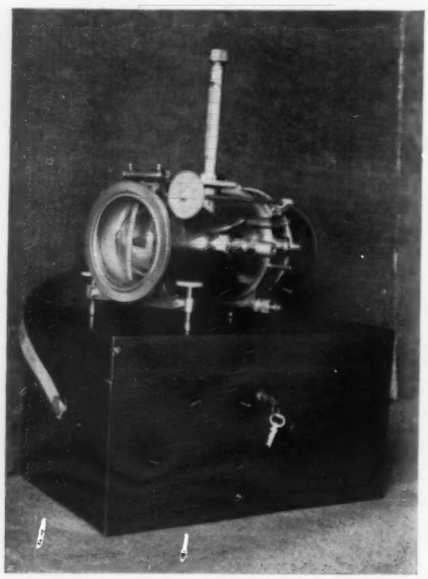
Fig. 8

Field Methods for Determining Specific Gravities of Gases

By EDWIN S. FULLER*

THE measurement of rates of gas flow by means of orifice meters involves the determination of the correct coefficient for the orifice installed in the gas line. for a given orifice plate in a given line, the orifice coefficient varies inversely with the square root of the density of the material passing through the orifice, the density being the weight of a unit volume of the material.

For convenience in the computation of orifice coefficients for gas, so-called base



Anubis portable gas balance.

coefficients have been computed covering a wide range of combinations of orifice and pipe diameters. These base coefficients are computed on the basis of a perfect gas having a specific gravity of 1,000 at a standard temperature and pressure. In this case the specific gravity is the ratio between the density of the gas and the density of air. This base coefficient is therefore usually spoken of as the air coefficient. Any standard temperature and pressure may be used, but the values adopted locally by the Southern California Meter Association are a temperature of 60 degrees F. or 520 degrees absolute, and an absolute pressure of 14.73 pounds per square inch.

Tables have also been computed giving the factors to be applied to the base coefficients for the entire range of flowing temperatures and specific gravities usually encountered in orifice meter measurement work.

For specific gravity, these factors are the reciprocals of the square roots of the specific gravities of the gas being measured. Thus for a gas having a specific gravity of 0.500, the specific gravity factor would be 1.414 and the volume of gas passing through a given orifice under given pressure and temperature conditions would be 41.4 per cent greater than the volume of air that would pass through the same orifice under the same pressure and temperature conditions.

An examination of the data sheet giving these specific gravity factors shows that for a specific gravity of 0.600 an error of .012 in the determination of specific gravity would cause an error of 1 per cent in the gas measurement. At a specific gravity of 0.700 a 1 per cent error in gas measurement would result from an error of .014 in the determination of specific gravity.

It is evident, therefore, that in order to secure reasonable accuracy in gas measurement by means of an orifice meter, it is desirable to pay some attention to the means employed for the determination of the specific gravity of the gas passing through the orifice plate. It is the purpose of this paper to describe the methods and apparatus used in the field for the determination of gas gravities, to point out the errors involved by present methods, and to suggest means for improving this phase of gas measurement.

The determinations of specific gravities to be applied to field gas measurements are locally made in the following ways at present:

1. The direct determination at the point of measurement by means of the Schilling apparatus used periodically.
2. Determination in a laboratory with some form of gas balance using bomb samples drawn periodically at the point of measurement.
3. Determination by laboratory analysis of bomb samples from the point of measurement.
4. Determination by discharging bomb samples through some form of recording gas gravitometer located at some central point.
5. Direct determination at the point of measurement with a continuous sample flowing through some form of recording gas gravitometer.

The Schilling apparatus operates on the principle that the time required to discharge a fixed volume of gas under fixed conditions through a small orifice depends on the specific gravity of the gas. The apparatus is quite simple and compact, consisting merely of a metal-topped cylindrical glass bottle nearly filled with water, in which is suspended a graduated glass tube open at the bottom and equipped at the top with a three-way cock, one opening of which is connected with a tube containing a very small platinum orifice.

To determine specific gravities the graduated tube is withdrawn from the water and allowed to fill completely with air. The cock is then closed and the tube is pushed down into the water, trapping a tube full of air at an initial pressure of 10 to 12 inches of water. The graduations on the tube consist of two marks, one about an inch above the bottom, and other about an inch below the surface of the water in the outer bottle. After trapping a tube full of air the cock is opened to the small orifice and the air in the tube is forced out through the orifice by the pressure of the water rising inside of the tube. The time required for the water in the tube to rise from the lower to the upper mark is then observed by means of a stop watch. Several determinations of this time are made. The gas, the specific gravity of which is to be determined, is then introduced through the three-way cock without removing the tube from the outer bottle. This expells the air and water from the inner tube and when the cock is closed a tube full of the gas is trapped under the same conditions as the air in the original operation. The time required for discharging this gas through the small orifice is then observed in the same way as for the air. The specific gravity is then computed by squaring the ratio between the average times observed for discharging the gas and air.

While readings can usually be repeated with a fair degree of consistency, the accuracy attained with this apparatus is not of a very high order, owing to the personal equation involved in its operation. In actual use each bottle and orifice is calibrated against some form of gas balance and a correction factor is applied to the observations made with the Schilling apparatus. The orifice is necessarily so small that the presence of the slightest trace of moisture at the orifice seriously affects the results.

The second method is the one most commonly used at the present time. Samples of gas are picked up at the point of measurement at more or less regular periods varying from a week to month apart. These samples are collected in bombs, locally known as "pigs" and usually having an internal volume of about a quarter cubic foot. They are usually filled at pressures from 10 to 50 pounds gauge.

These samples are brought to some central point where some form of gas balance is set up permanently, and gravity determinations are made on samples withdrawn from the "pig." The Edwards balance, which is most commonly used for these determinations, consists of a small gas-tight cylindrical chamber in which a small displacement float is mounted on a balance beam carried on needle points resting in a glass trough. The buoyancy of the displacement float depends on the density of the atmosphere surrounding it, and its position varies with variations in the density. In use, the pressure of the gas in the chamber is brought to such a point that the balance beam is exactly horizontal, and the pressure is observed with a mercury column. This means that the gas in the chamber surrounding the float is always compressed to the same density, and the lower the specific gravity of the gas the higher pressure must be applied to compress it to the standard density as measured by the balance float when the beam is in a horizontal position. The specific gravity of the gas sample is

*Presented before the Southern California Meter Association, April 27, 1933.

therefore determined by the ratio between the absolute pressure required on the gas and the absolute pressure required on air to bring the balance to a horizontal position.

If the float chamber is air-tight so that steady accurate pressure observations can be made, and if care is taken that the needle points and glass troughs are in perfect condition, very accurate specific gravity determinations can be made with the Edwards balance, and results obtained with this apparatus are usually accepted as standard.

The laboratory analysis method is usually employed only when some question arises as to the accuracy of determinations by some other means. By this analysis the percentages of various hydrocarbons in the gas are determined, and the specific gravity of the gas mixture is computed from the known specific gravities of the constituent parts.

In the comparatively few cases where a recording gas gravitometer is available, the easiest and quickest way to determine the gravity of a "pig" sample is to run the gas from the "pig" through the recorder. The personal equation is thus removed, and the accuracy of the determination depends only on the accuracy with which the recorder is calibrated.

With all these determinations made from bomb samples it must be remembered that the gravity determined is only that of the gas *taken from the bomb* and that this value indicates only the specific gravity of the gas at the measurement point at the moment the sample was drawn. The ultimate accuracy of the figure used for computing the orifice coefficient depends therefore on the relation between these momentary determinations and the actual average specific gravities during the entire period between observations.

For this reason the only truly accurate method of specific gravity determination would be to install a continuous recorder at the point of measurement. At the present time this is done only at points where large transfers of gas are involved.

This accuracy, however, could be approached more closely if means were available for frequent easy and accurate determinations of specific gravity in the field at the points of measurement.

With this object in view, the Anubis portable gas balance has been developed recently in the laboratory of George Sidney Binckley, C. E. in Los Angeles, Calif. In this apparatus an attempt has been made to secure the portability of the Schilling bottle and the accuracy of the Edwards balance, and both of these results seem to have been accomplished. At the same time greater speed can be attained in the determination of gravities than is possible with either of the types mentioned.

The apparatus is completely contained in a carrying case about 12 inches long, 7 inches high, and 8 inches wide. It consists of a small cylindrical gas bomb in which is mounted a pendulum balanced displacement float. The balance beam is mounted on flat polished sapphire surfaces so that it is free to tilt up and down frictionless supports. As the density of the gas surrounding the displacement float changes, the degree of tilt changes until the moments of the float and the pendulum are equalized. The instrument has an adjustable zero which can be moved to coincide with the position of the pointer on the end of the balance beam. The adjustable zero is driven by an external micrometer screw and the instrument is so calibrated that the density of the gas surrounding the float is read directly on two scales. Unit density is taken as that of air at 60 degrees F. and 30 inches of mercury absolute pressure, or at any other desirable standard. Units and tenths are then read on a fixed scale mounted inside the bomb and hundredths and thousandths on the graduated head of the micrometer wheel.

The gas bomb has three legs, two of which are threaded, and is equipped with level bubbles, so that it can be levelled up on any kind of surface by adjusting the two front legs. The front end of the bomb has a plate glass window. Mounted in the bomb is a mercury thermometer and a small aneroid barometer having a range from 21 to 31 inches of mercury absolute. By means of these, the internal temperature and pressure are read through glass windows.

In use the apparatus is set down on any convenient surface near the measuring point, and gas is circulated through it by means of a flexible connection. While the bomb is being purged, which takes not over one minute, it is levelled up. The gas is then shut off at the bomb intake valve and the bleeder valve is closed. The internal balance is then let down on the sapphire surfaces and allowed to swing to its balanced position. The zero point is then moved up to agree with the indicator and a direct reading of the density is made. The internal temperature and pressure are then observed, and from these values a factor is taken from a table to reduce relative density to specific gravity.

It has been found that the complete operation described above can be carried out in from three to five minutes, including the time required for replacing the instrument in its carrying case, and that when once set up, repeat readings can be taken in one minute or less. The accuracy attainable with this apparatus is at least comparable with that obtained with the Edwards balance.

When not in use the balance beam is clamped in such a way that no injury can be sustained by the frictionless supports, and the instrument can be freely transported from place to place.

One decided advantage that this instrument offers is the possibility of determining the specific gravity of gas in lines operated at less than atmospheric pressure, under actual line conditions, without intermediate compressing of the sample weighed. This can be accomplished by purging the instrument with a pump and allowing the pressure to equalize with the line before taking the reading, or by connecting the balance around the orifice plate and using the differential pressure for purging. In either case the density reading is made at line pressure, and the errors involved in compressing the gas are avoided.

The few gas gravity recorders that are now installed, indicate that variations in the specific gravity of the gas flowing in mains are of considerably greater frequency and magnitude than is ordinarily believed, so that very considerable errors are known to be involved in the assumption that periodic samples represent average specific gravities.

It is essential, therefore, that if more accurate gas measurement is desired, more frequent observations should be made of the specific gravity of the gas at the points of measurement, in order that the average gravities may be more closely approximated. It is believed that the new Anubis portable gas balance offers a valuable means for increasing the accuracy of field determinations of specific gravities.

Poncho for Meter Reading in Rainy Weather

LOS ANGELES Gas and Electric Corp., Los Angeles, Calif., has introduced something new in the way of equipment for rainy-day meter reading. The device is a poncho of light rubberized material which snaps on the sides and collar, and has an isinglass window arranged to allow the meter reader to record data in his book without exposing the book to the rain.

The equipment, invented by L. A. Blomgren, assistant chief meter reader for the company, has been in use for the past winter, and it was reported that there were no wet books among the meter reading crew during the rainy season. It has been approved as standard equipment in the company.

Meter Group Has Interesting May Program

SOUTHERN California Meter Association members held their May 25 meeting at Hotel Lafayette, Long Beach, with a good attendance present to hear an interesting program. The first paper was by H. M. Crawford of the Los Angeles Gas and Electric Corp. who dealt with "Automatic Control of Moisture in Natural Gas for Domestic Distribution" and discussed the Los Angeles company's experiences with injecting moisture into gas distributed in its extensive system.

A 500-foot motion picture film showing earthquake damage in Southern California was shown through the courtesy of Harold E. Howard, general sales manager of Ducommun Corp., who took the film shortly after the March 10 temblor.

Concluding the program was a talk on "Underground Surveying of Oil Wells", by Alexander Anderson. Mr. Anderson's paper was well illustrated by slides and models of oil well survey apparatus, and was received with much interest.

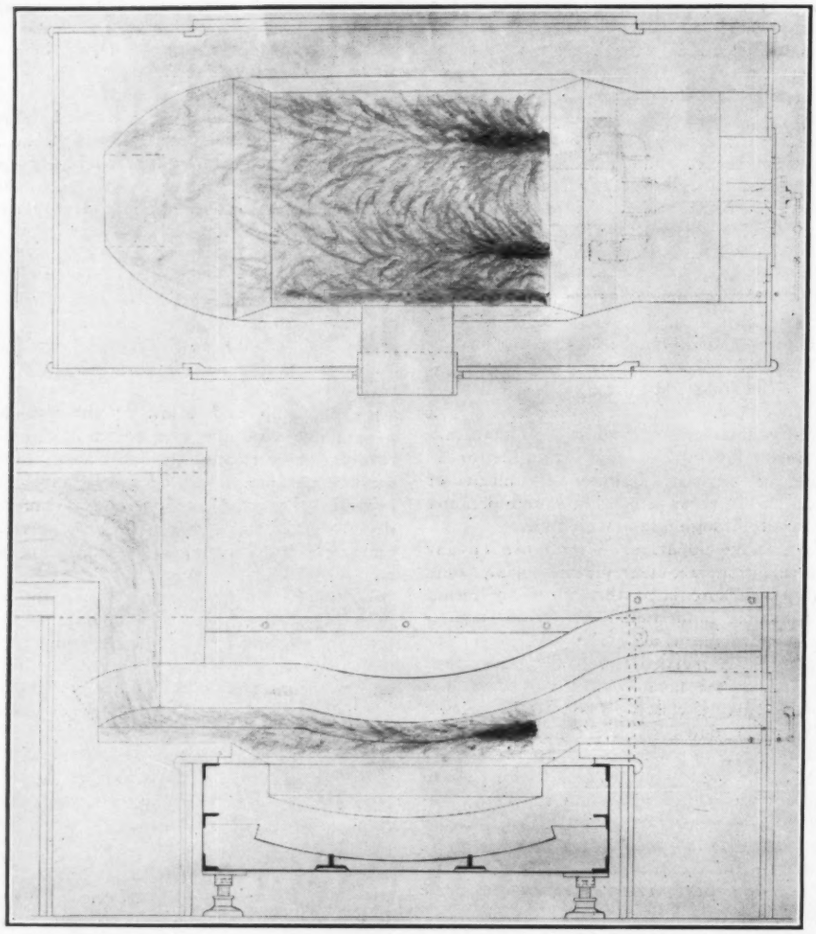


Fig. 3

Converting Metallurgical Furnaces to Gas

(Continued from Page 11)

and 3 feet per second in the body of the furnace. These velocities are at the temperature existing and are of course controlled by the cross sectional areas of the furnace chamber. The contour of the inside of the furnace must be smooth to avoid turbulence.

The fuel gas is admitted at very low velocity from the sides of the throat downstream of a low bridge wall built across the end of the furnace. The exact location and height of the bridge wall are of critical importance. The preheated air is brought from the checker chambers through larger ducts so that the restricted throat is able to direct the flow as would a nozzle.

The degree to which the performance may be anticipated in the design depends upon the accuracy of assumption of temperature and volumes of the gases which will exist in actual operation. The bridge wall would seem to create turbulence and disturb the streamline flow and such would be the case were it not for the introduction of a volume of gas at that point. Apparently best results are obtained when the bridge wall is just high enough to provide a space on the downstream side which when filled with incoming fuel gas, imparts to that gas a velocity approximately equal to the velocity of the air stream above it. In this way the gases flow over the bath in two substantially parallel layers, combustion taking place between them and extending over the entire surface of the bath in a highly luminous dense flame.

The whole scheme resembles the Surface Combustion diffusion flame system. The extremely high temperature of the air and the reversing flow, however, complicate matters and make it necessary to employ the simplest possible application of the principle.

Reverberatory Furnace

The principle of luminous flame combustion may be applied on other types of furnaces. Recently a reverberatory furnace for silver melting was converted to natural gas. Venturi type burners were applied utilizing gas at 25 pounds pressure. At first one burner was applied in the same position as the oil burner had been. After a period of operation, it was found that the combustion space provided at great expense for oil was detrimental to the use of gas. A false end was built into the furnace as shown in Fig. 3 and two nozzles connected to a manifold with one venturi inspirator. The flame could then be directed down on the bath and highly satisfactory performance resulted. After melting, it was customary to ladle the molten silver out of the furnace through the charging door. With the door open the silver seemed to rapidly dissolve oxygen so that the bars cast from it were porous and unsatisfactory. With oil it has been customary to cut down the air blast and fill the furnace with a smoky flame which seemed to exclude the oxygen. Closing the air shutters on the gas burner tended to smother the flame and in any event did not prevent the absorption of oxygen by the bath. A port was placed in the end of the furnace on the charging side and raw gas at low pressure was admitted in conjunction with the regular burners on low fire during the ladling period. It was found that the raw gas, when properly admitted, completely enveloped the charging door with a heavy yellow flame and effiectively disposed of the free air. This raw gas is used only when ladling or sampling while at other times the main burners alone operate under conditions of almost perfect combustion. The admission of raw gas is set by means of a permanent restricting orifice so that when the valve is opened wide the proper conditions are produced.

In other applications where the radiating or reducing qualities of an oil flame seem to be desirable, it is possible to reproduce the same conditions with gas with much more uniform control. Equipment has been made available for this purpose by the burner companies and its use is recommended in most cases. There are conditions, however, when an improvised layout has some advantages. Recently, one of our customers on a sliding scale rate was desirous of increasing his use of gas but was not in a position to make large investment in furnace changes nor was he content to await the necessary tests to justify the expenditure, before using gas. With this immediate objective the air atomized oil burners were changed sufficiently to burn gas and the desired flame and atmosphere produced by the introduction of raw gas. The results eliminated all doubt as to the suitability of gas for that operation. The elimination of the expense of pumping air is now the only objective. The expense of elaborate burning equipment will be justified by that alone.

While the method of admitting raw gas is simplicity itself, the behavior is critical. Under proper conditions a very small amount of raw gas will regulate the flame and atmosphere of a large furnace. Apparently however, if not heated to a high enough temperature before combustion or if too rapidly mixed with air or products of combustion of other burners the effect is that commonly experienced when operating with a deficiency of air; the flame is cold and bluish in color and useless and hazardous.

The desired effect is entirely different in appearance. The flue gas analysis may not differ greatly from that existing in the clear furnace, in fact excess air may be present, yet the flame is dense and opaque and the behavior entirely different as regards scaling and heat penetration.

COMMITTEE:
DOUGLAS BUCKLER . SO. CALIF. GAS CO.
J. EARL JONES . . . SEATTLE GAS CO.
J. CHARLES JORDAN (CHAIRMAN) P. G. & E.
F. U. NAYLOR . . . . . P. G. & E.
D. L. SCOTT . . . . L. A. G. & E. CO.

HEADQUARTERS:
PACIFIC COAST GAS ASSOCIATION
447 SUTTER STREET SAN FRANCISCO
H. L. MASSER (L. A. G. & E. CO.) PRESIDENT
CLIFFORD JOHNSTONE, MNG. DIRECTOR

P.C.G.A. NEWS

CO-OPERATIVE ADVERTISING

TYPICAL ADVERTISEMENTS

1

"I.E." (the Industrial Engineer) symbolizing modern gas service, animates this message featuring the "Xclusive Laundry," Stockton, Cal. (Pacific Laundry Journal and Dry Cleaner.)

Among the more than 50 ads comprising the 1933 trade journal campaign, are messages especially prepared for *eleven* different industrial classifications. Nearly all include testimonials by industrial gas consumers, and photographs of actual installations. *This co-operative advertising is now in its fifth year.*

At the right is a powerful message from a Seattle bakery, Rotary Bread Company, describing increased sales and profits resulting from a gas-oven installation. (Western Baker.)

2

SCHEDULE OF JUNE ADS

Appliance Dealers: **Western Appliance Retailing; Western Plumbing & Heating Journal.**

Architects, Builders: **Architect & Engineer; California Arts & Architecture; Pacific Builder & Engineer; Southwest Contractor & Builder.**

Hotels, Restaurants: **Keeler's Hotel Weekly; Pacific Coast Record; Western Restaurant.**

Miscellaneous: **Western Baker; Western Confectioner & Ice Cream News; Pacific Dairy Review; Pacific Factory; Pacific Laundry Journal & Dry Cleaner; Western Machinery & Steel.**
(A total of 19 publications regularly carry this Coastwise campaign.)

WATCH THIS SPACE EACH MONTH FOR MORE NEWS AND VIEWS OF THE COOPERATIVE ADVERTISING.

TECHNICAL NEWS SERVICE MAKES RECORD

Up to April 1, 1933, 32 articles, prepared by our Technical News Service, had been published in western trade and industrial magazines. To this list are now added 11 published during April, or a total of 43 reported since the first of the year. Self-evident, we believe, is the value of such feature articles (many illustrated) as these which appeared during April:

Publication and Title of Article

ARCHITECT AND ENGINEER—"A Hillside Home in Pasadena"—Description of residence of Clarence B. Piper, Pasadena; gas-fired heating installation with automatic control of room temperatures.

PACIFIC DAIRY REVIEW—"Use of Gas Fuel at Adohr Plant"—Gas boilers at Adohr Creamery, Los Angeles, with automatic damper control for fuel and air mixture.

WESTERN HOTEL REPORTER — "Navy Installs Big Kitchen at San Diego"—Gas ranges at U. S. Naval Training Station, one of the largest installations on the Coast.

KEELER'S PACIFIC HOTEL REVIEW—"Gas Saves Fuel at Beverly Hills Hotel"—Gas boiler plant with automatic damper control for proportioning fuel and air.

WESTERN RESTAURANT — "Simon's Chain Expands Through Depression"—Gas cooking throughout system of Simon's Lunch Rooms, Ltd., Los Angeles, highly successful chain of dining houses.

WESTERN RESTAURANT—"Naval Kitchen Uses Gas Fired Equipment"—Gas ranges at U. S. Naval Training Station, one of the largest kitchens on the Coast.

WESTERN BAKER—"New Oven"—New gas-fired Master Baker ovens being manufactured in Seattle.

HOTEL NEWS OF THE WEST—"Resorts Ready for New Business Deal"—Gas cooking at Arrowhead Springs Hotel and Resort, Lake Arrowhead.

PACIFIC FACTORY—"Unit Heaters Solve Industrial Heating Problem" — Advantages of gas unit heaters for commercial and industrial heating; installations at American Can Co.; Calif. Fruit Wrapping Mills; and Pac. Gas and Elec. Co.

WESTERN CANNER & PACKER—"Gas-Fired Dehydrators Show Savings in Fuel Costs"—Gas-fired dehydrating of prunes in Santa Clara Valley; description of dryers used and savings effected.

PACIFIC BUILDER AND ENGINEER—"New Automatic Robot for Gas Pilot Light Control."

Fred Karr Heads Missouri Association

FRED KARR, president St. Joseph Gas Co., St. Joseph, Mo., was elected president of the Missouri Association of Public Utilities at the annual convention of the organization held April 27 and 28 in St. Louis, Mo. Mr. Karr succeeds A. E. Bettis, Kansas City Power & Light Co., Kansas City, Mo., who had been president the past two years.

Fred Karr

The other officers elected were: First vice-president, D. W. Snyder, Jr., Missouri Power & Light Co., Kansas City, Mo.; second vice-president, C. E. Michel, Union Electric Light & Power Co., St. Louis, Mo.; third vice-president, C. F. Farley, Kansas City Power & Light Co., Kansas City, Mo.; treasurer, Hermann Spoehrer, Union Electric Light & Power Co., St. Louis, Mo.; secretary, N. R. Beagle, Missouri Power & Light Co., Jefferson City, Mo.; assistant secretary, Jesse Blythe, Jefferson City, Mo.

The new executive committee elected is composed of: Maj. T. J. Strickler, Kansas City Gas Co., Kansas City, Mo.; W. H. Swift, Jr., Springfield Gas & Electric Co., Springfield, Mo.; E. H. Lewis, St. Louis County Gas Co., Webster Groves, Mo.; L. W. Helmreich, Capital City Water Co., Jefferson City, Mo.; A. E. Bettis, Kansas City Power & Light Co., Kansas City, Mo.; Fred H. Luecke, Missouri Public Service Co., Warrensburg, Mo.; Harry Newman, Missouri Utilities Co., Cape Girardeau, Mo.; H. M. Patton, Union Electric Light & Power Co., St. Louis, Mo.

Among features on the general sessions program was an address by B. J. Denman, Chicago, Ill., vice-president, United Light & Power Co., and member of the Board of Directors of the American Gas Association. Mr. Denman spoke on "Problems Gas Companies Must Solve," telling of the active competition of electric cookery. He stated that in his opinion 90 per cent of all gas ranges in use today are obsolete, and that from the standpoint of the utility, if these ranges are not replaced by modern gas ranges, they are very apt to be replaced by electric ranges.

Edward F. McKay, manager of the Oklahoma Utilities Association, Oklahoma City, in an address on "Municipal Plants and So-called 'Taxless Towns'," gave detailed figures concerning the several towns in Oklahoma which have been referred to as "Taxless Towns." His figures disproved claims that these towns with municipal ownership were able to exist without taxation for city purposes.

The place for holding the next annual State convention will be chosen by the executive committee of the Association at its meeting to be held shortly.

Hotzone Broiler-Griddle Now on the Market

THE Welsbach Company of Gloucester City, N. J., has added to its list of gas consuming devices the Hotzone Broiler-Griddle — a combination broiler and griddle, and when equipped with a specially constructed hinged detachable oven, baking and roasting facilities are made available.

The new broiler-griddle is designed particularly for use in chain restaurants, quick lunch places and lunch wagons, where space is at a premium and an almost universal appliance required.

A feature of the appliance is its patented burner construction. The burners are provided with nichrome grids which the gas flames heat to a dull red temperature producing penetrating red and infra-red rays.

The griddle plates are constructed of cast iron, five-eights of an inch in thickness.

Rails for supporting the broiler racks are numbered for convenience of the operator and gas cocks have three positions: "off." "low heat" and "high heat." The intermediate low-heat gas consumption is adjustable in its setting.

Both the griddle and broiler are divided into two equal parts so that only one-half may be used if desired.

Gas Service Co.'s Annual Spring Range Campaign Begins

The Spring Range Campaign, an annual event of the Gas Service Co. organization, got under way on May 22, and will last for six weeks, closing on July 1. The campaign has been planned by the new business department under F. M. Rosekrans, manager of the department.

Representatives of the new business department in the various properties of the company throughout Kansas and Missouri were permitted to select the range which they desired to feature, with a choice of three major lines. In some of the territory two lines were being featured in the specialized effort.

The Gas Range Gazette, published for the duration of the campaign in 1932 is being sent out weekly, showing standings of the new business departments of the various properties throughout the state, and offering comment and encouragement to the contestants. Standings will be based on the number of ranges sold per territory representative.

Pioneer And Oklahoma General Properties Bought by O. N. G.

PURCHASE of the properties of the Pioneer Gas Utilities Co. and the Oklahoma General Gas Co., which operate in suburbs of Oklahoma City, has been announced by the Oklahoma Natural Gas Corp., Tulsa, Okla., which distributes gas in Oklahoma City and surrounding territory. The newly acquired utilities have been furnishing gas service to residential and industrial consumers in territory adjacent to that served by the Oklahoma Natural.

Rate reductions for Nicoma Park, Harrah, Choctaw, McLoud and other Pioneer territory, and for Nichols Hills and other Oklahoma General territory, were announced by R. W. Hendee, president of Oklahoma Natural, following the completion of negotiations.

Operation of the Pioneer and Oklahoma General properties was started Monday, May 1, the official announcement said, to be operated as part of the Oklahoma City district of the Oklahoma Natural organization. It will be under direction of Thomas H. Sterling, district manager of Oklahoma Natural.

Effective with May consumption, the residential rate for customers in the Pioneer territory will be 45 cents per 1,000 cubic feet for the first 100,000 cubic feet, and 18 cents per 1,000 cubic feet for all over 100,000 cubic feet used a month, instead of the former rate of $1 for the first 1,000 cubic feet. The Oklahoma Natural 45-cent rate also will apply to residential service in Nichols Hills and other Oklahoma General territory instead of the former rate of 50 cents per 1,000 cubic feet.

The acquisition of these properties adds approximately 800 customers and 70 miles of lines to the Oklahoma City district, which previously included Norman, Chandler, Wellston, Luther, Arcadia, Edmond, Britton, El Reno, Yukon, Bethany and intervening territory in addition to Oklahoma City.

Frank T. Hulswit, Founder of United L. & P. Co., Passes

Frank T. Hulswit, founder and former president of United Light and Power Co., died at his home in Grand Rapids, Mich., on April 2. He was a founder of the United Light and Railways Co. which expanded and became United Light and Power Co.

Mr. Hulswit was well known in the gas industry, and at the time of his death was a member of the Advisory Council of the American Gas Association.

BUTANE - PROPANE NEWS
Covering Liquefied Petroleum Gas Service

Underfiring Coke Ovens With Propane

By E. D. MAURER

Assistant Engineer
Wm. A. Baehr Organization, Inc.
Chicago, Illinois

ILLUSTRATING again the versatility with which butane-propane products may be applied to supplement conventional gas making processes, this discussion gives the experience of a coke oven plant which through the use of propane was able to reduce its coke production by 1400 tons a month and still fill its gas production requirements. Mr. Maurer's discussion was a feature of the A.G.A. Production and Chemical Committees' joint conference held May 22-23 in New York City.—Editor.

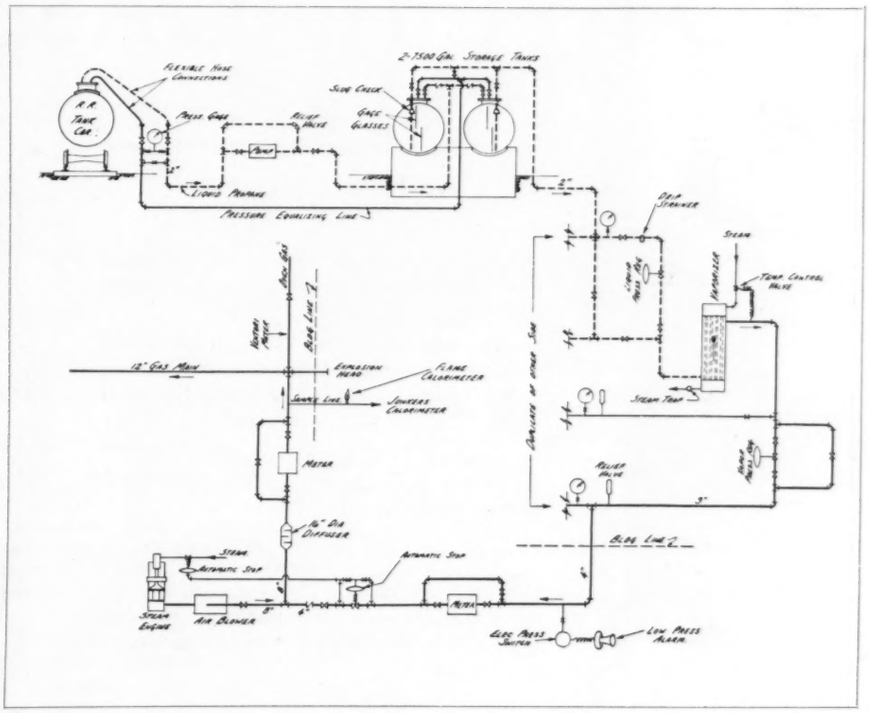


Fig. 1.

THE coke oven plant at which liquefied petroleum gas for underfiring has been in use is owned by the North Shore Coke and Chemical Co., and is located at Waukegan, Illinois. It is a Koppers Becker Type Oven built in 1928, and consists of a single battery of 31 ovens, 9.1 tons each. The oven chamber is 23 feet 9 inches long face to face of doors, with an average width of 16 inches. It is normally fired with oven gas, and from one side only.

When business conditions caused a decrease in the market for coke, the ovens were slowed from a 15¼ hour coking time to 24 hours. The gas available for sale of course, decreased with the coke production. As it was desirable to maintain the gas sales as close to normal as possible, a means to accomplish this was sought. A producer plant was considered, but the required investment made it advisable to investigate other means to accomplish the desired end.

There was available from a nearby oil refinery a liquefied petroleum gas known as "PB 175." It is a paraffin hydro-carbon by-product of the oil refining process consisting primarily of propane.

Here was an outside source of fuel that was available in sufficient quantity at a point only one day distant in freight delivery time. Consequently, it was desired to investigate this fuel further.

Physical Properties:

Essentially the gas is 95 per cent or greater propane, and for practical use its physical properties were considered to be those of propane. This gas is very different in some respects from the gas we are accustomed to handle at a coke plant. It has a high heating value per cubic foot; the gas is heavier than air; it is a slow burning gas with a narrow range of inflammability but a low explosion limit.

(The author next describes a number of small scale tests which were run, firing six walls of the ovens. The first used the PB vapor diluted with air to 560 B.t.u. Some trouble with carbon deposits and with high gun temperatures was encountered. A mixture of 65 per cent PB-air and 35 per cent oven gas was next used. Carbon deposits were very slight, and gun temperatures did not rise. In a third test waste gases were used for diluting the PB vapor to about 560 B.t.u., no oven gas being mixed. Operating results were good, save that the condensate from waste gases was highly corrosive. From the above tests the following conclusions were reached).

Conclusions from Small Scale Use:

1. Without further experimenting we could not successfully use propane diluted with air as the sole fuel for underfiring.

2. With the proper waste gas cleaning and control equipment, propane gas can be diluted with waste gas and might be successfully burned 100 per cent for underfiring.

3. Propane can be diluted with air to 560 B.t.u. and successfully burned in a two-thirds mixture with oven gas, and without requiring much expenditure for equipment.

These conclusions led to a decision to underfire the entire battery with a mixture consisting of 35 per cent oven gas and 65 per cent of propane diluted with air to approximately 560 B.t.u.

The mixed gas which we intended to use as a substitute for straight oven gas has some important differences. Instead of being a fast burning gas with few inerts and a low specific gravity, it has a much smaller percentage of the fast burning hydrogen, a large amount of inerts, and a fairly high gravity. We could, therefore, expect to increase gas pressures in order to obtain the

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necessary heat input. Due to the long, slow burning flame characteristics we could expect heat distribution more similar to that secured with producer gas underfiring.

Layout of Equipment:

To give an idea of the quantity of liquefied gas involved in this plant, it may be stated that for an assumed fuel requirement of 1100 B.t.u. per lb. of coal carbonized, we would be handling about 15.6 gal. per ton of coal carbonized.

In making the arrangements and selecting the equipment to handle this large volume of liquefied gas, a desire to minimize the cost of investment was of considerable importance. It was realized that the combination of circumstances and conditions which made the use of this liquefied gas economical at this time would change,—thus limiting the period over which the investment could be amortized.

A schematic diagram of the final layout is shown in Fig. 1. Propane is handled from the railroad tank cars to storage tanks, and from there to the vaporizer as a liquid. The pump for transferring liquid from the railroad tank cars to the storage tanks is located adjacent to the track. This pump is a special close clearance horizontal 5x5 inches single cylinder power pump driven through a V-belt drive by an explosion-proof totally enclosed fan cooled electric motor. Particular attention was given to providing sufficient ventilation for the pump house and to electricity that might accumulate on the sion was also made to remove any static electricity that might accumulate on the V-belt drive.

The two storage tanks are 7500 gallons capacity each, electric arc welded and designed for a working pressure of 225 lbs. gauge. Each is equipped with a relief valve, liquid level gauge glasses, and pressure gauges. There are swing check valves on the tank inlet lines and slug checks in the eduction pipes of the tanks.

The pressure control and vaporizing equipment is located approximately 400 feet from the storage tanks and just outside the propane-air mixing room. This equipment consists of a vaporizer supplied with 60 pounds steam. This vaporizer is like the one described and used in the experiment,* except it contains 61 sq. ft. of surface. The temperature of the propane vapor is controlled at 80°F. by an automatic regulator valve in the steam line. A pressure regulator on the high pressure side of the heat exchanger reduces the liquid pressure created by the vapor pressure in the storage tanks to 15 lbs. A second pressure regulator on the vapor side of the heat exchanger reduces the pressure further.

The gas as it enters the mixing room is in the form of undiluted vapor at approximately 4 lbs. It is metered and then diluted with air which is supplied by a positive impeller type blower. Steam engine drive

*In the small-scale experiments it was found necessary to construct a heat exchanger making use of a nearby source of steam to vaporize the liquid propane. The heat exchanger was made up by welding fourteen 1¼-in. steel pipes 5 ft. long into a piece of 16-in. steel pipe about 6 ft. long. This vaporizer is operated in a vertical position, with 60-lb. steam entering the inside of the tubes from the space above the tube header and discharging through a trap from below. The propane flows counter to the steam. There are 30 sq. ft. of surface.

was used on this blower because of the need for flexible speed control. The diluted propane is metered by a rotary displacement meter and is then mixed with oven gas. This mixing is accomplished in a 12-in. tee with PB-air entering one side of the run, oven gas through the other, and the mixture fed to the fuel gas main through the tee outlet. Oven gas is controlled as before with a hand operated valve and pressure maintained by the oven gas fuel holder.

To protect against possible trouble from failure of propane pressure in the mixing room, an automatic alarm and control system was installed. An electric siren is actuated by a pressure gauge on the 4-lb. vapor line. This alarm operates at 3 lbs. and below. If the oven heater or foreman does not respond, or is unable to locate the cause of the falling pressure, a system of multiple-spring, diaphragm stop valves acts to automatically close the propane vapor line and also shut down the steam engine on the air blower. In such an event, partial pressure is maintained on the fuel main by the oven gas. This automatic arrangement has functioned several times, and each time performed definitely and quickly.

Throughout the earlier experimental work it became evident that screwed joints in pipe work were very unsatisfactory. Consequently, in all new work welded joints were employed wherever possible.

Control of the B.t.u. of the diluted propane gas is not automatic. Heating value is checked daily by a Junker's calorimeter. A direct reading calorimeter burns continuously to give an indication of B.t.u between Junker's tests. The uniformity of B.t.u. is dependent on the accuracy of pressure and temperature regulation, on the propane vapor and on the speed control of the air blower.

The arrangement was laid out with the idea that it should be as simple, dependable and safe as possible, not to require the addition of any labor to the payroll, and to do the work of supplying diluted propane to the fuel main without refinements until results justified further expenditures.

Results:

The plant operating costs chargeable to the use of this fuel (over and above the delivered cost of the liquefied gas) are very nominal. They consist mainly of the electric current used by the liquid unloading pump (approximately 15 K.W.H. per tank car) and the steam used by the 5 H.P. engine on the air blower and in the vaporizer. There has been no additional operating labor chargeable to this fuel.

Results from the 10 months operating to date of writing are quite satisfactory. We found it advisable, on account of the effect of the high specific gravity of the mixed gas on heat distribution, to change gas nozzles in 9 of the 16 vertical flues of each wall. The areas of the nozzles before and after the change are given in Table No. 1.

These changes improved operations a great deal, but we still found it required more careful attention to hold the battery in balance than with oven gas firing. This change of gas nozzles does not prevent going back to 100 per cent oven gas for underfiring for a short time at the sacrifice of some efficiency. Waste gas temperatures have been practically the same as with coal gas under-

TWO OUT OF THREE

Of all Liquefied Gas Cylinders in Service Were Manufactured by Hackney

Perhaps the most convincing evidence of Hackney's outstanding position in this field is:

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..... *(Name)* ..... *(Position)* ..... *(Company)*

..... *(Street Address)* ..... *(City)* ..... *(State)*

TABLE NO. 1. GAS NOZZLE AREAS

Flue No.	Before Change (Oven Gas)	After Change (Mixed PB and Oven Gas)
	Sq. In.	Sq. In.
1	0.60	0.52
2	0.52	0.52
3	0.52	0.52
4	0.52	0.52
5	0.52	0.52
6	0.56	0.52
7	0.56	0.52
8	0.56	0.52
9	0.56	0.56
10	0.60	0.60
11	0.60	0.60
12	0.60	0.65
13	0.60	0.65
14	0.65	0.70
15	0.70	0.83
16	0.83	0.90

firing. The quality of coke produced has been maintained with this method of underfiring.

The use of this fuel has resulted in an increase in heat supplied per pound of coal carbonized. We have been decreasing this loss in efficiency since our first use of the fuel and are now approximately 5 per cent from the heat required with straight coal gas. However, we are not satisfied that we have reached the most efficient point in burning this fuel and are endeavoring to improve operations.

The economies of the use of this type of fuel are entirely dependent on local conditions, such as plant arrangement, availability and price of fuel, freight rate from source, coke and gas market, etc. Consequently, no attempt is made here to discuss this phase of the problem. For our particular plant the use of liquefied petroleum gas has proved very satisfactory.

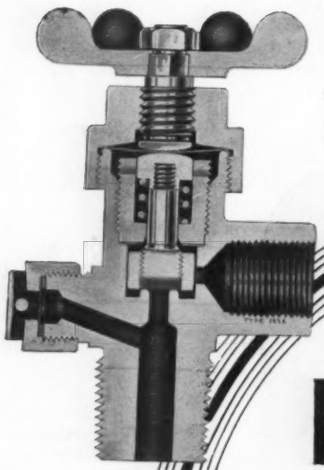
Its use for underfiring has permitted us to operate the coke plant so as to release for sale approximately 22 million feet of oven gas per month without the production of 1400 tons of coke per month for which there was no satisfactory market.

Report Increase in Send Out for Canajoharie Butane Plant

Following completion of the first full year of operation, the plant of the New York Power and Light Corp. which serves butane gas in Canajoharie and Palatine Bridge, N. Y., reported that gas send-out has increased from 605,300 cubic feet in January, 1932, to 1,168,900 cubic feet in January, 1933. Approximately 37 per cent of the customers have installed automatic water heaters.

Dunsmuir and Yreka Districts Combined Under J. R. McDonald

J. H. Warner, representative of Natural Gas Corp. of California in the Yreka District, has resigned that position. The Dunsmuir and Yreka districts are now combined, with J. R. McDonald manager.



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Incorporating the soundest principle in the construction of cylinder valves yet developed . . . the result of over 22 years of progressive manufacture . . . triple metal diaphragms insure long, uninterrupted, gas-tight service . . . seat inserts and diaphragms readily renewed . . . diaphragm replaceable while under pressure . . . positively sealed against leakage . . . has successfully withstood the Underwriters' Laboratories severe pressure tests of 11,250 lbs. per square inch without failure . . . so designed that years later every part may be individually serviced at a minimum cost.

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Combination Torch and Melting Pot

The Johnson No. 8 Torch and Melting Pot is a model of efficiency. A powerful hand torch and efficient melting pot are combined in one handy unit. Write for complete details and prices.

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135 Bluxome St., San Francisco, Calif.

Tests Prove Butane's Economy for Powering Locomotive Engines

A new field for use of liquefied petroleum gas, in powering gasoline locomotives, has been tested out during the past two months on the Southern Pacific Co.'s run between Los Angeles and Santa Barbara, a distance of about 100 miles. The train on which the tests were made consisted of a passenger coach, Pullman, and baggage car, and the butane gas was supplied by Shell Petroleum Co. of California from its Wilmington plant.

The tests are reported to have shown 2 to 3 cent savings per mile for fuel, and reduction in operating expense of engine oil by 1 or 2 cents per mile, the Union Pacific system is understood to be considering the use of butane in the new all-metal streamlined train which it intends to build, and which, it is predicted, will attain a speed of 110 miles per hour.

Carbon Black Production Lower in 1932 But Sales Increase

The production of carbon black during 1932 amounted to 242,700,000 pounds, a decline of 38,207,000 pounds, or 14 per cent, from 1931, according to a statement released by the U. S. Bureau of Mines. This was the second successive year in which production has decreased.

Although the export market for carbon black has expanded rapidly in recent years while sales in the country have declined, the distribution to domestic consumers is still the most important element in demand. In 1932 total domestic sales were 161,483,000 pounds, or 229,000 pounds below the 1931 total. Exports in 1932 were 100,072,000 pounds, or 3 per cent higher than in 1931.

First Propane Plant for Wisconsin

WISCONSIN Rapids Gas Co., Wisconsin Rapids, Wis., affiliated with Liquefied Natural Gas Co., Minneapolis, Minn., has been granted permission to construct a plant for the distribution of propane gas in Wisconsin Rapids and a score or more of other towns in Wood, Portage, Juneau and Waushara counties. The company plans to build a plant and distribution system in Wisconsin Rapids, and to serve bottled gas on a utility basis in the other towns. Construction of the plant will get under way immediately, according to statements credited to Lee H. Barker, president of the organization, and H. Henley, engineer, both headquartered in Minneapolis.

The following towns will be served: *Wood County*—Auburndale, Milladore, Arpin, Sherry, Wood, Hansen, Siegel, Rudolph, Grand Rapids, Seneca, Cranmoor, Dexter, Port Edwards and the eastern section of Remington. *Portage County*—Lynwood, Pine Grove, Almond, Plover, and parts of Buena Vista and Carson. *Juneau County*—Finley and Maceda. *Waushara County*—Plainfield, Oasis, Rose, Hancock, Deerfield, Wautoma and Coloma.

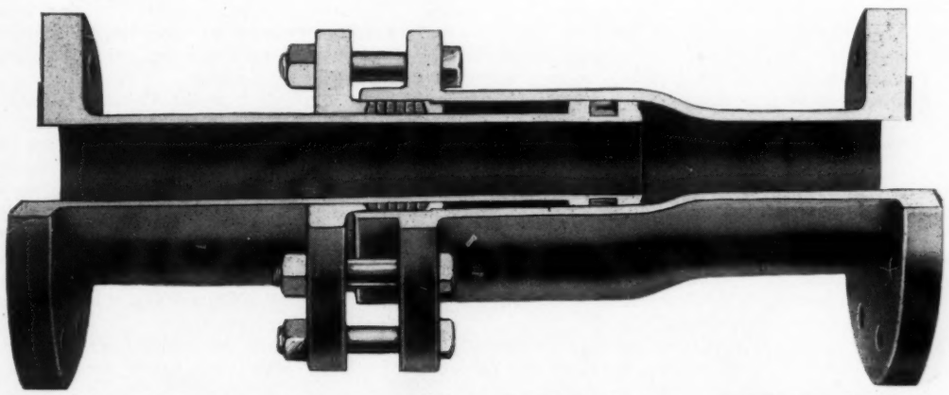
The gas will have a calorific value of 2,550 B. t. u., and will be served at the following rates:

Monthly service charge	$ .75
First 1,000 cubic feet	1.75 per M
Second 1,000 cubic feet	1.50 per M
Third 1,000 cubic feet	1.25 per M
Over 3,000 cubic feet	1.00 per M
For househeating, all consumption	.75 per M

The company has been granted an extension from July 1 to November 1 to have its plant in operation.

Tracy Plant of Liquefied Natural Gas Co. Under Way

Liquefied Natural Gas Co., Minneapolis, Minn., has begun construction of a central plant for the service of propane gas in Tracy, Minn. The company plans to serve the gas through a distribution system in Tracy and to surrounding towns from the central plant as bottled gas.



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Are Used Extensively on High Pressure Lines in the Belridge and Kettleman Hills Oil Fields.

FEATURES:

- Lucas Safety Expansion Joints are of forged steel.
- Available for high pressure pipe lines at low or high temperatures.
- Internal safety guide prevents freezing and parting of joints under extreme expansion or pressure.
- Long bearings against barrel prevent side motion of sleeve and deterioration of packing.
- Sleeves are of extra heavy chromium plating in order to withstand corrosion.

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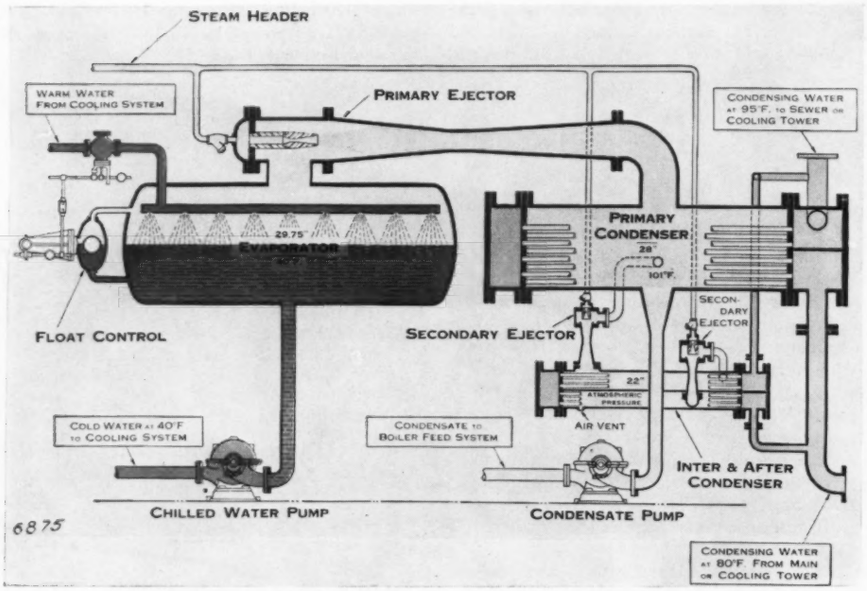


The diagrammatic view on the left shows a large size horizontal Decalorator unit for use in larger buildings. Units for use in homes and smaller buildings are built in a vertical type.

American Gas Products Corp. Introduces New Air Conditioning Equipment

AMERICAN Gas Products Corp., subsidiary of American Radiator & Standard Sanitary Corp., has just put on the market a complete line of indoor weather-making products. Rolland J. Hamilton, president of the American Radiator Co., in announcing the new development last month, stated that the full line of products is being exhibited at the Century of Progress Exposition at Chicago.

Several developments described as being of an entirely new nature are being presented. One is a refrigerating machine which is used with the gas operated indoor weather manufacturing plant. It is known as a Decalorator and uses steam for cooling. An American Gas Products Corp. Ideal gas boiler is used to produce the steam for summer cooling as well as the hot water needed for winter heating. A plant of this type is installed in the "Garden of Comfort" at the Exposition. It is housed partially in glass where its operating cycle can be followed by visitors.

The gas boiler and the steam refrigeration unit are part of a plant which also purifies the air, humidifies in winter, dehumidifies in summer and circulates the air the year around. The system can be made in sizes for homes as well as for the largest of office buildings and for industrial plants.

It was designed by engineers of American Blower Corp., Detroit, Mich., subsidiary of American Radiator & Standard Sanitary Corp., but promotion and sale of it as a gas-fired conditioner will be handled by the American Gas Products Corp.

The Decalorator has no moving parts, uses water as a refrigerant, and will chill water as low as 35 degrees Fahrenheit.

Chilled water is produced by the practical application of the well known physical law governing latent heat of vaporization. Water under high vacuum will vaporize at low temperatures. To produce evaporation the sensible heat of the liquid is given up in the form of latent heat in the vapor. Chilling of the liquid is consequent to this conversion of heat.

The accompanying flow diagram shows the operation of the Decalorator. A vacuum of 29.75 inches mercury is maintained in the evaporator chamber. The water to be cooled is introduced into the evaporator in the form of a fine spray. Thus sufficient water surface is present to cause an almost instantaneous evaporation of a small quantity of water. This instantaneous evaporation is termed "flashing."

In this particular example (where 40° F. water is required) only about one per cent of the water is "flashed" into vapor, absorbing its heat of vaporization from the remaining 99 per cent, thereby chilling the main body of water to the required temperature.

The chilled water is pumped from the evaporator to the cooling apparatus.

Steam introduced through the steam jet and traveling at high velocity through a Venturi tube produces the vacuum in the evaporator.

Standard methods of steam condensation are employed to reconvert this steam and the "flashed" vapor into liquid.

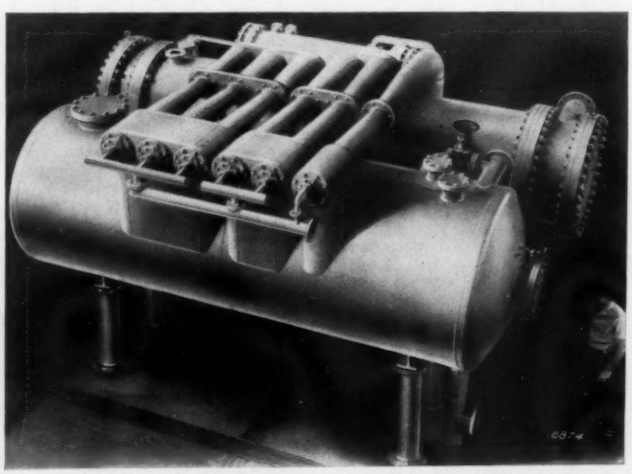
In addition to air conditioning, the Decalorator will serve other cooling purposes such as cooling drinking water and other liquids, and process work.

Operation of the unit is automatic. A float control maintains a constant level of chilled water in the evaporator. A thermostatic control valve shuts off the steam to the ejectors when the chilled water temperature goes below any desired temperature. In the case of a varying load the thermostatic control turns the unit on and off, thus reducing steam consumption.

Low and medium pressure piping is required. Steam at any pressure may be used and it is not necessary to consider live loads in foundation design.

Also exhibited at the Chicago Exposition is a gas-fired air conditioner for home use exclusively. It makes use of tap or mechanically refrigerated water for summer cooling, circulating the cooled water through copper finned elements through which the air to be cooled is forced. The same elements are used for winter heating by using hot instead of chilled water. This plant will be marketed through utility companies by the American Gas Products Corp.

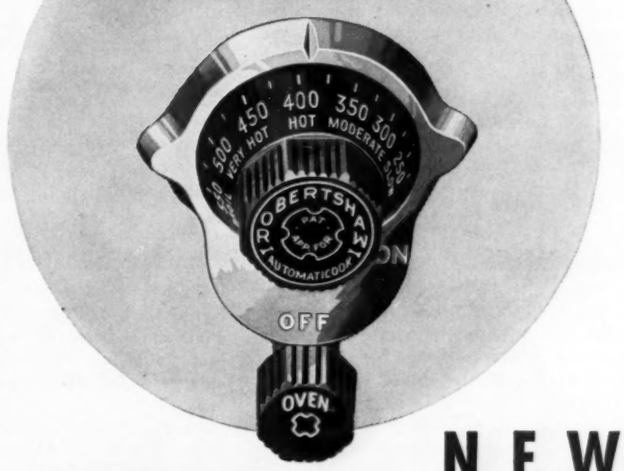
In addition to the complete weather manufacturing plants for homes and buildings,



AT THE RIGHT is shown one of the large size Decalorators, for use in skyscrapers or large industrial buildings. It has a capacity of 2,160,000 B. t. u.'s per hour.

OR

PERFORMANCE?



HOW silly to be browbeaten into a price war, when you have such a *decisive* selling advantage in your Robertshaw equipped ranges.

Every woman wants a Robertshaw . . . even more than she wants a range. She wants the freedom of automatic baking . . . and the certainty of trouble-free oven performance . . . that the Robertshaw has made famous to all American housewives.

In the name of sound business, then, get behind this Robertshaw idea and get out of the destructive argument of price . . price . . price. Sell performance . . Robertshaw performance . . and this price business will take care of itself, for America's finest ranges already are priced to give you the greatest range values ever offered.

Dig in, with the Robertshaw, and your gas range worries will be over. You know now, even more than ever before, that the cost of selling cheap goods never gives you the profits to which you are entitled.

ROBERTSHAW THERMOSTAT COMPANY
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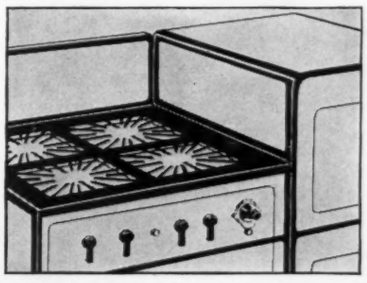

NEW

Model "F" Combination Thermostat and Oven Valve. Both units—grouped together for convenience and attractive design—are entirely separate in operation and adjustment.

FOR TABLE TOP OR CONSOLE RANGES

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"AutomatiCook"

American Radiator & Standard Sanitary Corp. and its subsidiaries are presenting equipment which can be added to heating systems now in use so that these installations can be utilized for summer cooling as well as winter heating, and for circulation of air throughout the year.

Products of American Gas Products Corp. play a leading part in the exhibit in the "Home of Artificial Weather," or the American Radiator Building. In addition to the weather making equipment, this subsidiary is showing a new 20-gallon water heater, known as a De Luxe model. It is square in shape, follows "modernistic" lines, and in other ways deviates from the customary type of water heater.

Other product innovations shown by American Gas Products at the Exposition are an AGP Ideal Gas Convertor and a new throttling control valve. A representative line of gas boilers and water heaters make up the remainder of the company's gas exhibit.

Connecting-Rod Angularity in Gas Engines

(Continued from Page 16)

with the increase in the ratio between the connecting rod length and the crank length. Therefore, for best operation of engines in which events occur well ahead of centers, the timing on each end should be adjusted for equal clearances, rather than for equal flywheel position.

One of the practical results of this unequal timing was observed in the operation of the double-acting engines at the Ventura plant of Southern California Gas Co. It had been our experience over a considerable period of time that the outboard inlet valves "carboned up" during operation, while the inboard valves did not. A tarry carbon deposit was formed which choked up the inlet passage. Both inlet valves were set to open when the flywheel was 30 degrees ahead of dead center. Therefore, since the crank ratio was 5 to 1, the piston was 1.91 inches from the end of the stroke on the outer end, and only 1.31 inch from the end of the stroke on the inner end, when the valves started to open. This means that at the time the inlet valves open, a larger body of exhaust gas, under probably a higher pressure and temperature, is confined in the outboard cylinder. The result is that the confined gas rushes into the inlet passages, causing impurities in the fuel to coke, and deposit. The effect is most severe where the highest temperature is found—the outboard end.

To remedy this condition, it is necessary only to retard the outboard events, until the clearances at each end are equal when the inlet valves start to open. This was done on one unit about four months ago, and recent inspection indicated the outboard carbon deposit had been reduced to a minimum, merely by timing the engine properly.

Readjust O. N. G. Capital Structure

ANNOUNCEMENT was made late in May by Oklahoma Natural Gas Corp., Tulsa, Okla., that a plan has been prepared for readjustment of the capital structure of the company. The plan is being submitted to all preferred stockholders for their approval. The purpose of the plan is to reorganize the stock set up of the company to meet present economic and financial conditions. The approval of the holders of the current notes of the company and of the common stockholders, after several months of negotiations, has been obtained by the readjustment committee.

Holders of $4,277,172.26 direct obligations of the company have agreed, according to the offering which is being sent to preferred stockholders, to surrender these obligations for an issue of $4,200,000 of 10-year 6 per cent second mortgage bonds. Holders of second preference stock aggregating approximately $3,132,800 have agreed to surrender this stock to the company for cancellation. Holders of 99 per cent of the common stock have agreed to give approximately 20 per cent of the common stock to the preferred stockholders, all on condition that the preferred stockholders approve the plan. The first mortgage bonds are to remain undisturbed.

Holders of the 6½ per cent cumulative preferred stock are given an opportunity to exchange their present holdings, and for each share are to receive one new share of preferred stock and one share of common stock; while each share of 7 per cent cumulative preferred stock would receive one share of new preferred stock and 1 1/10 shares of common stock. The new preferred stock is to have a par value of $50 a share; preferential dividends of $5 per share per annum, cumulative from January 1, 1939; and redeemable at $50 plus any accrued dividends.

Arkansas Valley Gas Co. Plans to Move July 15

The Arkansas Valley Gas Co., Arkansas City, Kan., has signed a 5-year lease on the Jarvis building in that city and plans to move its offices to that location on July 15. The new quarters consist of two floors and the basement, and will afford space for warehousing of appliances, a meter shop, and a club room for employees. The basement will be utilized for gas company cars, tools, fittings and supplies. J. G. Mawson is manager for the company, a Gas Service subsidiary.

Cooking School for Colored Women in Kansas City

Forty-five hundred colored women attended the three sessions of a cooking school in Kansas City, Mo., conducted by the Kansas City Gas Co., in cooperation with the Second Annual Cooking School and Home Makers Institute, held there April 13-15. A Detroit Jewel gas range, supplied by the Detroit-Michigan Stove Co., was awarded as a grand prize by Charles S. Wagner, district manager of the stove company.

Dorothy Clock-Diggle, formerly home service director of the gas company, conducted the school.

Kentucky Utilities Moving to Lexington; Watt Acting President

LEWIS B. HERRINGTON resigned as president of Kentucky Utilities Co. and associated companies, including Old Dominion Power Co., Lexington Utilities Co., Kentucky Power & Light Co., and their subsidiaries, at the general offices of the corporation in Louisville on April 25. His duties have been assumed by Robert M. Watt, executive vice-president, appointed acting president.

Mr. Herrington was elected president of Kentucky Utilities Co., in March, 1927, succeeding Harry Reid, and re-elected this year. He joined the company as vice-president and general manager in 1917, and has been in the utility business continuously since 1904. He has been president of the Kentucky Association of Public Utilities.

Mr. Watt has been connected with Kentucky Utilities Co. since its organization in 1912. He was for several years district manager in charge of all properties and operations in southeastern Kentucky and Virginia, and in February, 1931, was elected executive vice-president.

After June 1, general offices of Kentucky Utilities Co. will be in Lexington, where it has an $8,000,000 investment in operating properties supplying gas, electric and water service. The company has taken the upper three floors in an office building in Lexington.

Texas Cities Gas Co. Installs New Plant Equipment

Presaging a construction program calling for the expenditure of $50,000 in the city of Galveston, Texas, the Texas Cities Gas Co. last month installed new plant equipment which will raise the B.t.u. content of the gas manufactured in that plant to the equivalent of the natural gas being served in Galveston. The plant is used for standby service in the event of natural gas line failure. The construction program under way calls for renewal of mains and services, $20,000; extension of the distribution system, $15,000, and miscellaneous expenditures $5,000. Paul E. Nichols is manager for the company at Galveston.

State Institutions of N. D. May Use Native Natural Gas

The North Dakota Legislature recently passed a bill permitting the use of natural gas in state institutions provided the gas is produced in the state of North Dakota. The state has had a law on its books since 1893 which had been interpreted to mean that state institutions must use local lignite coal, and the law now permits the use of native natural gas on a parity with native coal.

FIRST MONTH IN BROOKLYN 1012 RETAIL SALES with NEW Air-Cooled ELECTROLUX

An additional 691 sales made wholesale to local builders and real estate operators

WITHIN a month after the introduction of the New Air-Cooled Electrolux, Brooklyn Union Gas Company set their all-time record for refrigerator sales. But it was not surprising. They had been hitting the high spots for weeks! During the first month, they netted a total of 1703 load-building sales with the New Air-Cooled Electrolux. Insured themselves 1703 more homes with all-gas kitchens. Over 59% of these sales were retail. The rest wholesale. And they're still going strong!

Demand has increased steadily

Let us quote the enthusiastic reports of B. U. G. Co.'s New Business bulletin. *The first week!* "So great has been the preference of Brooklyn and Queens residents for the New Electrolux that every retail refrigeration sales record in the company was smashed during the first week that the refrigerator was on sale." And the *second week:* "The New Air-Cooled Electrolux continued its record-smashing performance in sales during the week ending April 15th, despite the fact that the period included both Holy Week and the Passover Holidays." The third and fourth weeks saw even greater sales increases.

Electrolux gives impetus to other appliance sales

An important effect of the phenomenal public acceptance of the New Air-Cooled Electrolux was a sharp rise in *other* appliance sales. Reports Brooklyn's bulletin, "With Electrolux showing the way, sales records during the week ended April 8th fell like autumn leaves. During the week, orders were taken for 617 appliances . . . This total is far above that of any week this year."

There's still time to get your share

Brooklyn's record-smashing Electrolux sales are being duplicated in scores of other cities. It's an Electrolux year! And there's still time now to take advantage of the important trend to Electrolux-buying, if you act *at once*. For full information and sales and merchandising suggestions on the New Air-Cooled Electrolux, wire, phone or write Electrolux Refrigerator Sales, Inc., Evansville, Ind.

THE BROOKLYN GAS NEWS UNION

VOL. 8, NO. 51 MAY 6, 1933

Lost Time Accidents Lowest in Co. His

Lost time accidents dropp ring April to the lowest point t his- tory of this company, a re made public by C. C. Atwood Only two such accide ppened during the entire mont figure which cuts in half the l previous record. As compar the 15 lost time accidents re r April, 1932, this year's re presents a decrease of nearly 8 The total accident fell off sharply last month. T total was 36, as compared with for April of last year, a reduction 1 per cent.

Accident Record for Apr

	1933	1932
Total Accidents	36	61
Lost Time Accidents	2	15

Neither of the two lost time acci-

AIR-COOLED ELECTROLUX SETS ALL-TIME RECORD

Rising high above even the phenomenal records set the previous week, the new air-cooled Electrolux established a new all-time high for retail sales during the week ended April 29th, within a month after it was first introduced by this company.

Total refrigerator sales for the week amounted to 409 units, 283 of which were sold at retail and 126 at wholesale. All three figures are records for this year, and the retail figure is a new high for all time.

The rapid rise in refrigerator sales since the new air-cooled model was introduced may be noted in the following summary showing gross sales figures for the past four weeks. The new model went on sale April 5.

Week Ended April	Retail	Wholesale	Total
1	163	72	235
15	283	126	409
22	[illegible]	[illegible]	[illegible]
29	[illegible]	[illegible]	1,219

nounce Election Of Vice Presidents

F. ristopher Weber and B. G. Neilson ave been elected Vice Presidents this company. Mr. Weber is Vice sident in charge of Engineering tivities and Mr. Neilson Vice P ent in charge of Commercial A ies. Glen E. Foster has been a nted an Assistant Auditor of the pany.

Mr. ber became associated with this c pany on September 1, 1927, as Assi nt Vice President. Prior to that L. Doherty organization he was Service Co.), since his graduation in 1905 from Purdue University with the degree, B.S. in Civil Engineering. From 1908 to 1912 Mr. Weber was associated with the Freeport (Illinois) Gas Co., first as Superintendent and then as Secretary and

NEW BUSINESS BULLETIN of Brooklyn Union Gas Company reporting fourth successive week of unprecedented Electrolux sales increases.

NEW *Air-Cooled* ELECTROLUX THE *Gas* REFRIGERATOR

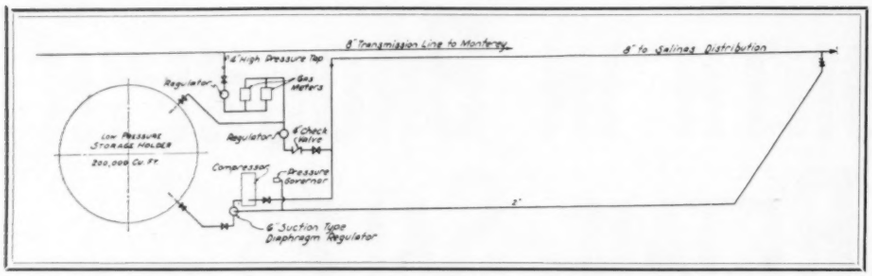

Fig. 1. Schematic diagram, final layout of the Salinas compressor station.

Automatic Compressor for Emergencies

(Continued from Page 8)

maintains the pressure to the distribution system at 2½ pounds gauge. If for some reason the pressure in the distribution system should sag to 1½ pounds gauge, the pressure governor makes contact and automatically starts the compressor through the across-the-line starter and at the same time turns on the water for cooling the compressor cylinder through the solenoid water valve.

The 6-inch diaphragm regulator then regulates the quantity of gas drawn from the low pressure storage holder and maintains 2 pounds gauge discharge pressure to the distribution system. When the pressure of 2½ pounds gauge is again restored to the distribution system through the transmission line, the pressure governor shuts down the compressor to the shutting off of the water and the cycle is complete. The unique feature of this automatic compressor is that the cycle is completed on a 1-pound differential and at extremely low pressures. These pressures seem to be the lowest of any on similar installations.

The suction type regulator is the ordinary diaphragm type with lever and weight with a 14-inch diameter diaphragm. The operation of this regulator is the main feature for the successful automatic operation of the compressor, for any pulsation to the top of the diaphragm would destroy the automatic operation, as the regulator would pulsate and the variation in pressure would start and stop the compressor through the pressure governor and would defeat the automatic operation.

In order to eliminate pulsation to the suction type regulator, a 2-inch line was connected to the top of the diaphragm and to the pressure governor and extended into the distribution system 300 feet, so as to get as far away from the discharge of the compressor as possible. To figure the size of this line, the volume in cubic feet of the diaphragm displacement must be known and using this as a basis, the size line can be figured that will operate the regulator from a full open or to a full close in a period of one second. So that any slight change in distribution pressure will be transferred to the regulator, thereby regulating the quantity of gas to the compressor that will maintain an even distribution pressure, as in this installation, the regulator was set for 2 pounds gauge.

In the 8-inch discharge line from the compressor, a 4-inch orifice disc was installed to eliminate the pulsation set-up by the compressor, as it was impossible to extend the 2-inch line any farther into the distribution system without a great deal of expense. The drawing shows the plant layout and the location of the 2-inch line connected to the distribution system.

From the 8-inch transmission line a 4-inch line is tapped off for the town of Salinas and the pressure is stepped down through regulators and on the town side of the regulators a 4-inch tilting disc, non-slam check valve is installed so that when the pressure has failed in the transmission line, the check valve will close, thereby eliminating the possibility of any gas flowing to the transmission line when the compressor is operating.

The reason for the automatic compressor station is that the town already had a 200,000 cubic foot, low pressure storage holder and that a compressor should be installed in order to supply the distribution system with a pressure above the low pressure holder. Also the compressor must be automatic so as to eliminate operators so that the operating cost would be more in line with high pressure holders.

Semet-Solvay Engineering Corp. Announces Bulletin No. 46

Semet-Solvay Engineering Corp., New York, has brought from the press its Bulletin No. 46, describing the new Semet-Solvay ignition arch process for utilizing heavy oils in the enrichment of water gas. The booklet presents a description of the process and a model of a water gas carburetor, designed to scale, showing how the installation will appear when complete. Copies may be had by addressing the company at 40 Rector Street, New York, N. Y.

Goldthwaite Franchise Granted

H. H. Shaw and Frank Kirk of Cisco, Texas, have been granted a 50-year franchise for the service of natural gas in Goldthwaite, Texas. Plans call for construction of a line from Brown County to Lampasas and Goldthwaite.

Adds 14,000,000 c. f. to Gas Load

The Atlanta Gas Light Co., Atlanta, Ga., recently added 14,000,000 cubic feet to its annual natural gas load through the installation of natural gas equipment at the ice company's plant.

Texas Gas Utilities Co. Completes Customer Survey; Begins Campaign

Texas Gas Utilities Co., Del Rio, Texas, recently made a consumer survey in the six towns of its service area. The population of the district is about 50,000, nearly 50 per cent of which is Mexican and not included in the survey, due to the lack of stability of that load.

The company found that in these six towns, the per cent of saturation for gas ranges was 54, for automatic water heaters 27, and for house heating, 62. The prospect summary revealed that there are 975 homes not using gas ranges, 1,754 not using water heaters, and 823 prospects for house heating equipment.

Following the compilation of the survey, a sales meeting was held by the company in Del Rio, which was attended by local managers and several manufacturers representatives, the purpose of the meeting being the outlining of sales campaigns for the coming months, in which newspaper advertising, direct mail, house-to-house canvasing and employee cooperation are being used.

Kentucky Natural Gas Co. In Process of Reorganization

Kentucky Natural Gas Co., Owensboro, Ky., a subsidiary of Missouri-Kansas Pipe Line Co., is being reorganized under the direction of W. J. Hinchey and Ernest Woodward, receivers. The plan was approved on May 12 by the United States District Court for the Western District of Kentucky, according to word received from the company.

The plan proposes to exchange 7 per cent cumulative preferred stock of a new corporation which is to be reorganized for the first mortgage bonds of the company, and common stock for the liabilities due general creditors.

Minneapolis Regulator Co. Issues Catalog Sheets on Industrial Motors

Minneapolis - Honeywell Regulator Co., Minneapolis, Minn., has brought from the press catalog sheets covering the company's new line of industrial motors for use in conjunction with the company's controlling devices. Copies may be obtained by writing the company at the above address.

Completes Natural Gasoline Plant in Turner Valley Field

Royalite Oil Co., Ltd., subsidiary of Imperial Oil Co. of Canada, has completed a plant for the recovery of gasoline from natural gas in the Turner Valley gas fields, Alberta. The plant has a capacity of 85,000,000 cubic feet and is estimated to have cost about $400,000.

Replacing Meters at Memphis

Northern Texas Utilities Co., Memphis, Texas, is replacing all of the meters on the Memphis system. The meters are being taken up, tested, repaired and repainted. The work will take approximately 90 days.

WHAT THE P·G· and E· DEALER BROADSIDE

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MAY 1-6
See the SPECIAL SHOWING
EUREKA RANGE
$99.50
SEE YOUR DEALER
P·G·E
EASTERN
NEWSPAPER ADVERTISEMENTS THAT DOUBLE THE PULLING POWER OF DEALER TIE-INS
4 STE
WILL INCREA
YOUR SALES
DEALER TIE-IN ADVERTISEMENTS
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Can you afford not to...
To women who would be BETTER WIVES... BETTER MOTHERS
COOK WITH Electricity
NEW SPEED AND A COOLER KITCHEN
Now it's easy
AUTOMATIC GAS WATER HEATER
SPECIAL OFFER NOW BY DEALERS & P·G·E

REPRODUCTION OF MAY BROADSIDE AND EXAMPLE OF TIE-IN ADVERTISING

SHOULD MEAN TO YOU

To hundreds of Appliance Dealers it is the signal for their monthly drive of hard-hitting *systematic* tie-in advertising. They have discovered the pulling power of P. G. and E. advertising when used as an attention-compelling base for their individual merchandising copy. They have learned that it is constantly telling a DESIRE-CREATING story of the things they have to sell, and more—FEATURING THOSE PROFITABLE, MAJOR APPLIANCES THEY *WANT* TO SELL.

The sustained FORCE of P. G. and E. advertising—its *regular* publication in your local newspaper—permits you to accomplish more with your advertising budget. Equal attention-value can now be obtained with smaller space, thus giving more advertisements per dollar and bringing into play the full force of powerful REPETITION. You can now replace spasmodic, shot-in-the-dark advertising with a planned schedule on a fixed yearly budget.

Dealer tie-in advertising has increased in volume more than 50% since August, 1932. Profit by the experience of the many dealers who, right in your own territory, are capitalizing on these dominating advertisements published the YEAR 'ROUND by P. G. and E. Refer to the monthly broadside. Its prevue of the month's advertising will give you new ideas for immediate, aggressive merchandising and allow you to plan in advance a methodical advertising and sales program of your own. P. G. and E. advertisements say "see your local dealer." Now, at moderate cost, you can *regularly* add—*HERE IS* YOUR LOCAL DEALER.

PACIFIC GAS AND ELECTRIC COMPANY

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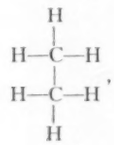
Combustion Reactions of Natural Gas

(Continued from Page 9)

undesirable and should be prevented if possible. This will be discussed further after examining the ethane reactions.

The Hydroxylation of Ethane

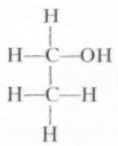
Ethane may be represented by the formula,



, or C_2H_6

(Ethane) .....(10)

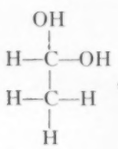
By adding a small amount of oxygen to the ethane there is produced,



, or $CH_3.CH_2OH$

(Ethyl Alcohol).....(11)

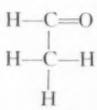
As in the case of the methane reactions, the next product is the very unstable dihydroxy ethane which occurs very fleetingly, if at all. It may be illustrated as follows:



, or $CH_3.CH(OH)_2$

(Dihydroxy Ethane).....(12)

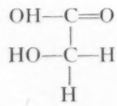
The two hydroxyl groups on the upper carbon atom then split off forming water, leaving



, or $CH_3.CHO$

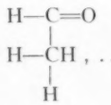
(Acetaldehyde) .....(13)

The acetaldehyde then breaks down in the following manner,



, ...(14)

forming water (HOH), carbon monoxide (CO) and formaldehyde (HCHO). There may be special cases, however, where the reaction is,



, ...(15)

forming hydrogen (H_2) carbon monoxide (CO) and formaldehyde (HCHO). For the purpose of this discussion it is immaterial whether we accept reaction (14) or (15). The important point is that if there is an interruption of the reactions at this point, there will be liberated free carbon monoxide which, for obvious reasons, is not at all desirable.

After reactions (14) or (15), as the case may be, the formaldehyde decomposes in accordance with reactions (5), (6), (7), (8) and (9) as shown under the hydroxylation of methane. It will be noted that of the 15 reactions which represent the hydroxylation of natural gas there are only four points where carbon monoxide is produced, namely, reactions (7), (8), (14) and (15). The safe and efficient utilization of natural gas, therefore, makes it imperative that safeguards should be established at these four vulnerable points.

An examination of reactions (7), (8), (14) and (15) indicates that carbon monoxide may be liberated from either of two causes; an oxygen deficiency or a temperature deficiency. The proper adjustment of appliances burning natural gas and an unrestricted atmosphere of secondary and primary air will readily eliminate the first of these causes. The proper placement of burners, with respect to the object or utensil to be heated, so that the flames will not impinge upon any cold or highly radiant surface will readily remedy the second condition.

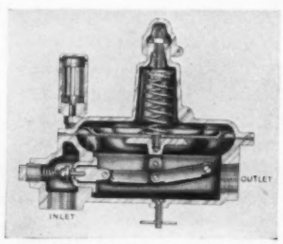
Proper adjustment and placement of natural gas burners is a subject big enough and important enough to warrant a separate paper. It is not intended, therefore, to discuss here either of these factors at any great length. In fact, it is not proposed to say anything about appliance adjustment other than that a very unskilled mechanic, comparatively speaking, can adjust a gas appliance so that there need be no fear that the reactions will not proceed to completion.

Even a casual observer can see when the flames are impinging upon some metallic or other heat-conductive material. If such a condition is known to be undesirable, its ease of detection makes it possible even for a novice to guard against it. In some cases, however, the gas flame cannot be seen by viewing the exterior of the appliance; one such case being the oven burner of the range; one might think, therefore, that a concealed flame is to be rigidly avoided. Such is not necessarily the case, for an unmistakable warning is given if combustion conditions are not proper. This warning is the very distinguishable odor of the aldehyde (formaldehyde and acetaldehyde) vapors given off when hydroxylation is interrupted. An accurate description of this characteristic odor is difficult to give, but a fair description would be that it resembles the acrid odor of stale garlic. These aldehyde vapors in themselves are not actually toxic, at least, scarcely more so than ordinary flue products. It is the simultaneous liberation of carbon monoxide with them as indicated by reactions (14) and (15) that is to be feared.

It may not be at once apparent that a piece of iron, for example, which is too hot to be held in the bare hand is actually a powerful cooling medium to a natural gas flame. The reason for this becomes obvious when it is realized that the ignition temperature range for methane is 1202°F. to 1382°F.†† and the range for ethane is 968°F. to 1166°F. Since natural gas is usually composed of 85 per cent and upwards of methane, it is not unlikely that most natural gases will have an ignition temperature around the lower limit of methane, or about 1200°F.

Some idea of how hot 1200°F. really is may be gathered from the fact that a piece of iron heated to a point where it will show a strong red in daylight has a temperature of only about 1175°F. It is evident, therefore, that an object may be quite hot, ordinarily speaking, and still exert a cooling influence on the flame. For practical purposes it may be assumed that anything, upon which the gas flame impinges, which does not become heated sufficiently to glow with an incandescent light will tend to cool the flame below its ignition temperature and consequently will interfere with the combustion reactions, and possibly result in the liberation of carbon monoxide gas.

Summing up this entire discussion, it may be said that the combustion of natural gas



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is essentially a series of complex chemical reactions, but notwithstanding this complexity, only a very small amount of supervision is required to insure safe and efficient utilization. This does not mean, however, that the industry should entrust its problems of utilization to unskilled or careless workmen.

REFERENCES

* Phil. Trans. Volume 159 (1893).
†"Flame and Combustion in Gases" by Bone & Townend (1927).
††"Fuels and Their Combustion" by Haslam & Russell (1926).

B. C. Electric Starting Second Unit of New Vancouver Plant

CONSTRUCTION of an addition to the gas plant of the B. C. Electric Railway Co. at Vancouver, B. C., is now getting under way. The new unit will increase the capacity of the plant by 50 per cent, stepping it up from 3,000,000 cubic feet to 4,500,000 cubic feet daily. Total cost of the new unit will be approximately $300,000. An initial $10,000 of this amount is being expended for laying of foundations for chamber ovens.

The first unit of this plant was completed in January and this activity marks the beginning of construction of the second unit.

The completed unit contains 24 intermittent vertical chamber ovens and 12 new ovens are to be added in the present construction program. One extra producer and waste heat boiler will be installed to heat the ovens. A rotary washer and scrubber have been ordered and two vertical cast iron condensers with a capacity for cooling 3,000,000 cubic feet of gas daily will be installed. A steam driven exhauster with a 3,000,000 cubic feet capacity and a tar extractor will also be added. Extensions will also be made to the naphthalene washer.

Construction will go ahead rapidly during the summer months, with the plant expected to be ready for operation in October.

Revive Interest in Bowdoin-Regina Gas Transmission Line

Thomas McManus, of Oak Park, Ill., is reported to be reviving the Regina-Moosejaw natural gas project, with plans for construction of a 175-mile line from the Bowdoin gas field in Montana to Regina, Saskatchewan. The project will call for an expenditure of approximately $3,500,000 for the transmission line, and an additional amount for gas distribution systems. According to reports from the district, National Supply Co. and Page-Hersey Tubes Co. are interested in the project.

New Gas Well Comes in at 4,120,000 c. f. in Central Michigan

A new well was brought in in the Central Michigan area recently with a daily production of 4,120,000 cubic feet. The well is known as Taggart's wildcat, J. H. Barton No. 1, in the southwest quarter of Section 11, Mecosta County. The well is located about 17 miles west of the Broomfield pool and about 7 miles southeast of Big Rapids.

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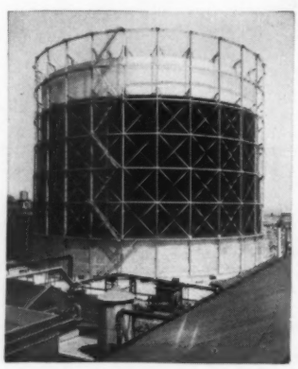

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Chester, Pa.

Natural Gas Operations in the Middle West

C. E. BROCK, general manager of the Kansas Power and Light Co., Salina, Kansas, in a recent address before the Kansas chapter of the American Petroleum Institute, surveyed the more important aspects of natural gas operations as pertaining especially to the Mid-Continent area. The following quotations from his remarks are particularly interesting:

C. E. Brock

"In order to be in a position to render 100 per cent service to its consumers the natural gas company must have ample gas reserves connected to its pipe lines at all times and in order to maintain this service any natural gas company must have sufficient open flow to take care of the peak hour demands on its system. Any natural gas pipe line system should be connected to more than one source of supply, as it has been learned through bitter experience that gas fields may fail at a time when they are most needed.

"The term 'open flow', as used in reference to gas wells, is the amount of gas a well will deliver to the air in 24 hours. The amount of gas that same well will deliver into a pipe line system is governed entirely by the rock pressure of the well and the line pressure on the pipe line system. For example, a gas well having 600 pounds rock pressure would be capable of delivering 30 per cent of its open flow capacity against a pipe line pressure of 350 pounds. Experience and practice in the gas business has taught us that a gas well should not be permitted to deliver more than 25 per cent of its open flow capacity for any considerable length of time, and that any larger per cent than this is injurious to the well and will shorten the life of the field. While there is no law governing the percentage of open flow which may be taken from a well in the State of Kansas, this practice has been largely followed.

"The market for natural gas is seasonable and varies under weather conditions. For example, the average daily gas load of the company which I represent is 35 per cent of the peak day load; 30 per cent of the peak day load is consumed between 6 a.m. and 12 noon and the peak hour load is 6 per cent of the peak day load. In order to render 100 per cent service a natural gas system must be constructed with sufficient capacity to take care of the peak hour load and this means that at times a very small percentage of the capacity is being utilized. In order to compensate for the peak hour load, industrial or dump load customers are solicited. These customers are served at a very low rate to compete with fuel oil or coal and are subject to being shut off in case the capacity of the system is required for domestic consumers. This statement should explain to

producers why it is impossible for natural gas purchasing companies to make contracts whereby they guarantee to purchase specific quantities of gas."

". . . Most natural gas purchasing companies have adopted the practice of prorating the gas purchased in each field in order that all producers will receive their percentage of the available market and while it is true that the natural gas reserves in the state of Kansas are estimated by the Kansas State Geological Department at seven trillion nine hundred and fifty billion cubic feet and it would seem that this reserve would supply the state of Kansas forever, we must all bear in mind that unless strong measures of conservation are maintained gas reserves are apt to be dissipated very quickly.

"The average life of natural gas fields in Kansas and Oklahoma is about 5 years, which means that the natural gas pipe line companies must be continuously taking up and relaying their pipe line systems and for this reason nearly all of the major gas pipe line companies doing business in the Mid-Continent area have extended their systems to the Amarillo field where the estimated life of Amarillo field where the estimated life of the gas reserves is from 20 to 50 years. These lines have no doubt been extended to this field with the hope that a more permanent supply can be secured; however, these major companies are not inclined to ignore available gas in Kansas and Oklahoma and take gas from Texas and I am convinced that they would all prefer to purchase Kansas and Oklahoma gas in order to maintain the reserves in the Amarillo field as long as possible.

"Over $100,000,000 is invested in natural gas pipe lines and distribution systems in the state of Kansas. Three hundred seventy-seven towns having a population of approximately 900,000 are being supplied with natural gas at the present time. Practically all of the industries in the state of Kansas depend upon natural gas for their fuel. Many of the pipe lines crossing the state are interstate pipe lines.

Although the company with which I am associated has been in business only four years it has produced and purchased from Kansas fields 45,514,000,000 cubic feet of gas having a value of approximately three and one quarter million dollars. Sixty seven and six tenths per cent of this amount was purchased from outside producers and 32.4 per cent was produced from leases in which the company is interested. These figures show that natural gas pipe line systems are at all times dependent upon the producers for the major portion of their gas supply."

"Handbook of Electric Weld Tubing" by Republic Steel Corp.

Republic Steel Corp., Youngstown, Ohio, has just brought from the press a "Handbook of Electric Weld Tubing." The booklet contains 68 pages of description, specifications and illustrations, and is of pocket size. This handbook is a pioneering work in the attempt to establish standards for the electric weld tubing industry. Copies may be obtained upon request to Steel & Tubes, Inc., 223 East 131st St., Cleveland, Ohio.

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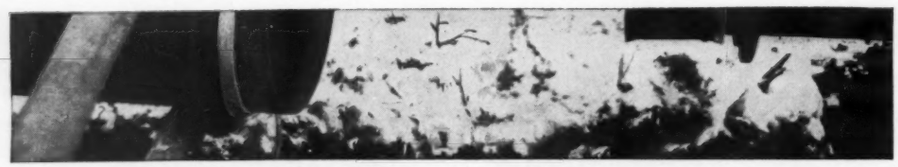

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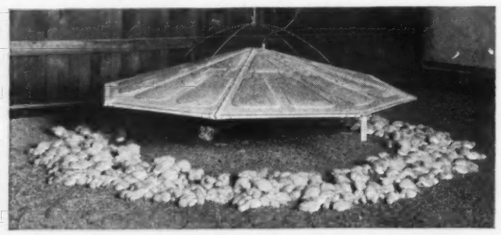

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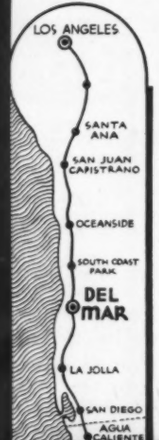

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Advantages of Natural Gas Shown in Boiler Operation

A saving of $7,000 during the year 1932 over 1931 in the operation of the Rochester, Minn., city light plant was effected by the use of natural gas in one of the boilers at the plant, according to L. A. Cowles, superintendent.

This information was made public in a report compiled by Burns & McDonald as a result of tests made to determine the relative efficiencies and economy of coal and natural gas in generating electricity. The test of the two fuels was made on two boilers, one 600 h. p. boiler being equipped with burners for gas fuel, and the other equipped with underfeed stoker for coal. These two boilers are depended upon to furnish the boiler capacity for the plant. Four smaller boilers are maintained for emergency use only.

The final analysis showed that about $12,450 could have been saved had natural gas alone been used under both boilers, with similar load conditions and costs. The report stressed the saving, not only in fuel, but in labor, materials and maintenance of the plant.

A. B. Harper Takes Dunham Scott's Place at Fort Smith

A. B. Harper has been appointed manager of Fort Smith Gas Co., and affiliated companies operating out of Fort Smith, Ark., taking the place left vacant by the resignation of Dunham Scott, manager since 1931. Mr. Harper's new position places him in charge of Southwestern States Gas Co., Twin City Pipe Line Co., Western Oklahoma Gas Co., Southern Gas Producing Co., Industrial Oil and Gas Co., Ozark Natural Gas Co., Arkansas-Oklahoma Pipe Line Co., and Fort Smith Gas Co., all headquartered in Fort Smith.

American Radiator Co. Takes Over Ross Heater & Mfg. Co., Inc.

American Radiator Co. announces the acquisition of the Ross Heater & Mfg. Co. Inc.

The service of these two companies to the gas and oil industry hereafter will be carried on by the Ross Heater & Mfg. Co., Inc. as a division of American Radiator Co.

Independent Utilities Corp. Gets Permit to Serve Carthage

Independent Utilities Corp., newly formed, has been granted a franchise for the service of natural gas in Carthage, Miss. The company plans to construct a line from the Jackson field to Carthage, a distance of approximately 45 miles, and to install the distribution system, metering equipment, etc., for the distribution of the gas.

Briar Creek Gas Co. Formed

Articles of incorporation have been filed by the Briar Creek Gas Co., Louisville, Ky., and have been approved by the secretary of state. Austin R. Middleton, Franklin S. Fitch and Albert Wassman are named as the incorporators.

Harry F. Haldeman, Inc., Opens Los Angeles Office

Newly formed for the purpose of handling the sales and engineering service for Papico Odorizers, the firm of Harry F. Haldeman, Inc., has opened offices in the Title Guarantee Bldg., Los Angeles.

The Papico Odorizing System was developed under Mr. Haldeman's personal direction while he was president of Pacific Pipe & Supply Co. Because of the increasing demand for engineering service in connection with this system, Mr. Haldeman established a separate company and purchased all sales and manufacturing rights from Pacific Pipe & Supply Co.

Papico Odorizers are in operation in 71 cities, and are used in connection with the odorizing of natural gas.

From time to time additional engineered products will be added by Harry F. Haldeman, Inc.

C. H. Rich Gas Goes to Clinton, Okla.; J. M. Foxx Mgr. for Missouri Natural

Charles H. Rich, for the past two years manager of Missouri Natural Gas Co., headquartered at Fredericktown, Mo., has resigned that post and is succeeded by J. M. Foxx, former sales manager for the same company. Mr. Rich goes to Clinton, Okla., as manager for Western Counties Gas Co., affiliated with Central States Power & Light Co.

Missouri Natural Gas Co. serves gas in Festus, Crystal City, Bonne Terre, Desloge, Flat River, Elvins, Farmington, Fredericktown and Poplar Bluff.

Two New Directors for Oklahoma Natural Gas Corp.

Two Oklahomans not previously affiliated with the Oklahoma Natural Gas Corp. were elected to the board of directors of the company at the annual stockholders' meeting at Baltimore, Md., according to announcement in April. The new members are Henry N. Greis of Tulsa and Frank Buttram of Oklahoma City.

Mr. Greis is president of Burke-Greis Oil Co., a director of the Mid-Continent Petroleum Corp. and the First National Bank of Tulsa. Mr. Buttram is president and owner of the Buttram Petroleum Corp. and has numerous oil, gas and banking interests.

N. R. Jones Engineer for Panama Power and Light

Norden R. Jones has accepted a position as gas engineer for Campania Panamena de Fuerza y Luz at Panama. Mr. Jones has been connected with the gas industry in the eastern United States for the past 20 years.

Williamson Gets Gallipolis Franchise

G. H. Williamson has been granted a 10-year franchise to serve natural gas in Gallipolis, Ohio. The franchise provides that the city may buy the gas system at any time.

Where Gas Needs to Be "FOGGED"

WHERE natural gas is introduced into systems designed for manufactured gas, dust troubles may arise. Oil fogging is the remedy—adding to the gas a certain proportion of oil in vaporized form. The devices for doing this must vary, according to operating pressures and other conditions. In any case, however, some type of diaphragm valve is called for. Chaplin-Fulton valves, of both the differential and the throttling types, are available for all such uses. Correspondence is invited on this or on any subject relating to gas regulation or other pressure control. C-F regulators have been known to the gas industry for forty years. Catalogs on request.

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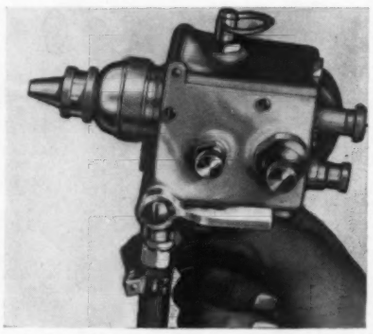

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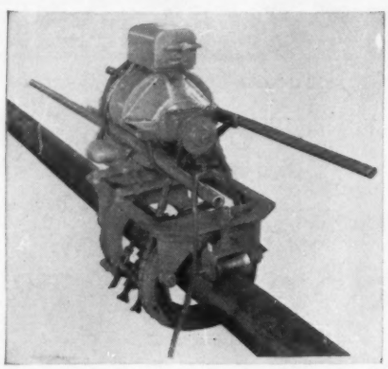

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Metal Spraying in Compressor Stations

(Continued from Page 17)

means of a small air turbine, is melted at the nozzle by an oxygen acetylene flame, and the molten metal blown onto the surface to be coated by compressed air. The speed of the molten metal being blown is approximately 30,000 feet per minute, or roughly speaking, 300 miles per hour, so that very little cooling of the molten metal can take place before it is deposited. Any metal which can be obtained in wire form can be sprayed. A few of the more common ones are lead, zinc, tin, copper, bronze, monel metal and stainless steel. The speed with which these can be deposited varies according to the melting point of the various metals.

The thickness of the coatings per coat, will vary from approximately .001 for stainless steel and hard metals, to .003 for softer metals.

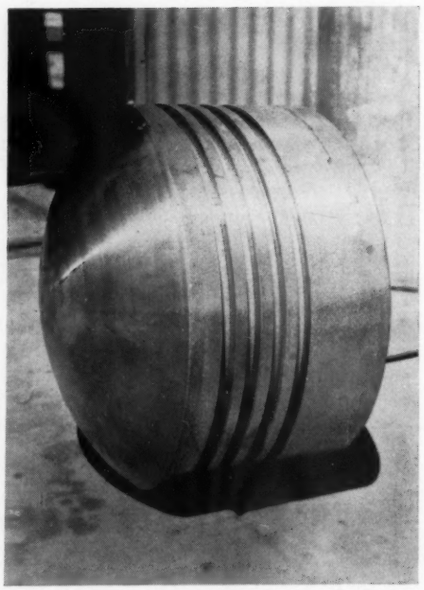
Approximately a year ago we had occasion to repair an 11-inch compressor cylinder that had several grooves about ¼-inch deep in the walls. This formerly was accomplished by the installation of a liner, and resulted in changing the size to 10½ inch. We decided to experiment with building the cylinder up by the spraying method.

The cylinder was first bored out slightly oversize with a rough cut in order to make room for the new metal to be deposited, and also prepare the surface for sand-blasting. The grooves were next filled with sprayed metal and then the entire cylinder wall was coated so that when the cylinder was rebored the resulting diameter was 11 inches. The material used on the job was called Norway Iron, and has about the same coefficient of expansion as cast iron.

This cylinder was recently inspected and found to be in excellent condition, with no sign of the sprayed metal chipping or peeling. Another application in which we have used metal spraying is the coating of exhaust ells and mufflers with aluminum. These have not been in service as long as the compressor cylinder, but we believe that they are entirely satisfactory. The muffler, which is exposed to rain and wind, shows no sign of flaking or peeling.

Another application was the spraying of the hot discharge lines from the discharge pit to the cooling tower. Lead was applied to these lines as a protective coating in the hope of reducing the maintenance cost of these lines. This application has only been in service a few months, so very little is known as to the success of this treatment, at the present time. Another local gas company has also been using this process for the protection of high pressure holders by spraying them with zinc. It is reported that on the portion of the recently laid San Diego line where galvanized pipe was used a coating of zinc was employed to protect the weld, the galvanizing having been burnt off in welding.

Another application was the coating of the face of a cast iron piston with aluminum in order to reduce the heat on the No. 1 ring of the piston, and thereby prevent the lubrication from being burned off and the rings sticking.



19-inch bronze piston from 400-h.p. engine, built up by metal spraying, approximately 3/16-inch on each side and then turned down 19.135 and reinstalled. Phosphor bronze wire was used in spraying. The face of the piston was not sprayed.

The face of one piston was coated with approximately 1/16-inch of aluminum and then lathe-turned to a smooth finish. This piston also had several thermocouples placed in it at different points, and the results compared with a similar piston having no aluminum coating (See Fig. 1). The temperatures in the center of the piston were reduced from approximately 700° in the cast iron piston, to 610° with the aluminum coated one, and from 525° to 390° in the No. 1 ring groove.

As the flash and fire points of the oil being used are 375° and 420° respectively, one can readily see that if this reduced temperature can be maintained the sticking of the rings will be greatly lessened.

While this experiment was not continued for a period of time due to a portion of the aluminum coming off, it shows definitely what can be accomplished. By a slightly different application of the sprayed aluminum we anticipate no further difficulty in the metal coming off.

Another piston with a sheet of transite attached to the face was also tested, but was not as effective as the aluminum coating. This transite did not last, due to intense heat, but gave much lower temperatures than the cast iron piston. (See Fig. 1 for results.) This is mentioned only because both tests were conducted at the same time, and is in no way related to metal spraying.

There are numerous other applications for metal-spraying, such as building up worn or scored power cylinders, pistons and piston rods, and it is contemplated to conduct additional experiments along this line in the near future.

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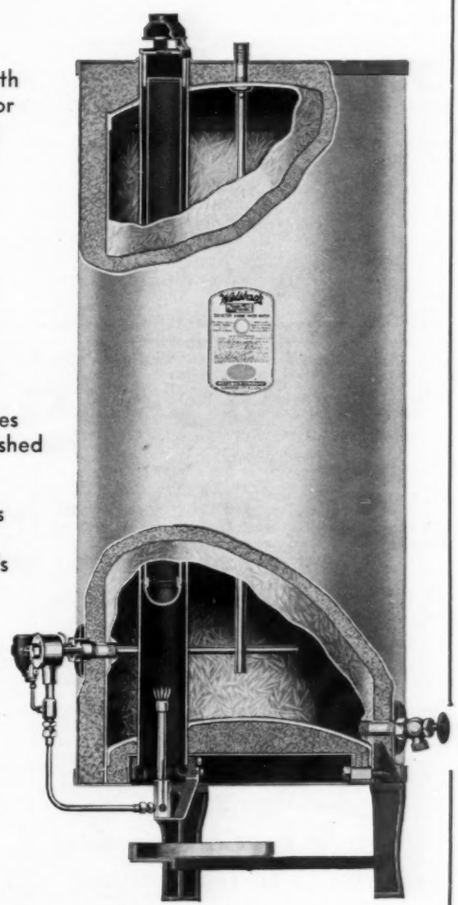

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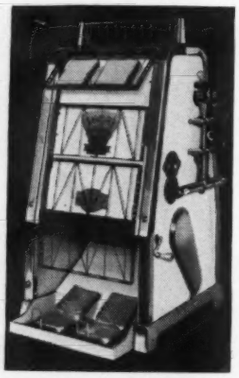

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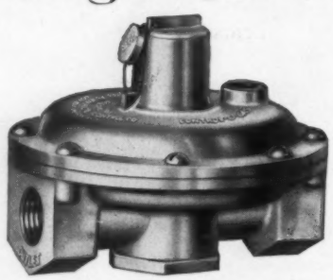

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Air-Conditioning Program and Exhibits in Los Angeles

AMERICAN Society of Heating and Ventilating Engineers, Southern California Chapter, met at the University of Southern California, Los Angeles, on May 23, for a program devoted to air conditioning and related topics. An exhibit of heating and air-conditioning equipment, sponsored by the Society, was also conducted from May 22 to May 29 in the Chamber of Commerce Building.

Among the papers given at the May 23 meeting were those by Paul D. Close, technical secretary of the American Society of Heating and Ventilating Engineers, on the general application of air-conditioning; H. L. Warren, heating engineer of the Southern California Gas Co., on the application of Silica Gel with special reference to dehumidification; E. H. Kendall, English and Lauer, on unit type conditioners; J. F. Kooistra, Carrier Engineering Corp., on cooling with steam. Other topics discussed by various speakers were heating by refrigeration; industrial applications of air-conditioning; sound engineering; recent developments in refrigeration as applied to air conditioning; heat transmission.

The exhibit at the chamber of commerce was participated in by 17 firms. Self-contained air-conditioning units using gas fuel for heating were shown by Payne Furnace & Supply Co. and by English and Lauer.

Plan to Expedite Heating Installations for St. Louis County Gas Co.

Owing to the rapid increase in heating customers on the lines of the St. Louis County Gas Co., Webster Groves, Mo., since the introduction of mixed manufactured and natural gas to the area, the company has devised an interesting plan designed to bring together the various operations necessary in adding a new heating customer to the load.

A group has been formed under C. E. Hartwein as supervisor, to have charge of the preparation of house heating estimates for each new installation, and the specification of burner equipment for conversion jobs. Assisting Mr. Hartwein in this work are E. G. Ronsick, G. E. Wilke, H. U. Fisher, W. H. Heinzle, J. G. Robertson, Paul Hamilton, Earl H. Mitchell, Arthur Henry and A. J. White, Jr.

The preparation of estimates is being transferred from the company's engineering department to this group which is made up of men of special experience in heating and ventilating work.

Republic's Central Alloy District Issues Brochure on Welding

A descriptive booklet, "The Welding of Enduro Stainless Alloys," is being released for distribution by Republic Steel Corp. Central Alloy Division, Massillon, Ohio.

The booklet contains information on various welding methods as applied to different types of Enduro stainless alloys, including electric arc welding, gas welding, spot and projection welding, seam welding and flash welding.

Copies of the booklet may be obtained from Republic Steel Corp., at the above address.

Classified Advertising

Classified advertising five cents per word; minimum $2.00 per insertion. Situation Wanted advertisements up to 50 words will be published three consecutive issues without charge. Small professional cards 1-in. deep by 21 ems wide are $6.00 monthly on 12-time contract.

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Meter repairman with four years experience in meter repairing, both tin and iron case, large and small capacity meters, desires permanent connection with reliable company. References. Address Box E-233, *Western Gas,* 810 South Spring Street, Los Angeles, Calif.

American Home Economics Convention to Be Held June 26-30

The annual meeting of the American Home Economics Association will be held in Milwaukee, Wisconsin, June 26-30, 1933, with the Hotel Schroeder as convention headquarters. "Home Economics in a Modern World" has been chosen as the general theme for the meeting.

At the annual meeting of the association a year ago in Atlanta about 1,000 home economists from schools and colleges, hospitals, utilities, and other commercial firms, were in attendance.

A well-planned program is given during the convention and a commercial exhibit by magazines, food companies, clothing companies and equipment companies is held in connection with it.

To Take Natural Gas Service to Louisiana Lime Products Co.

United Gas Public Service Co., headquartered in Houston, Texas, is beginning preparations for laying a 6-inch gas transmission line from a point about 15 miles northeast of Oakdale, La., to the plant of the Louisiana Lime Products Co. near Easton. The line will be about 8 miles long. Headquarters for operations are at Oakdale.

Changes in Personnel of Western Distributing Co.

Walter A. Gillespey has been transferred from the new business department of the Ozark Distributing Co., Carrollton, Mo., to Augusta, Kan., where he will succeed Joe H. Neill as manager of Western Distributing Co. Mr. Neill will go to the office of the Western Distributing Co. at Madison, Kan., where he will have charge.

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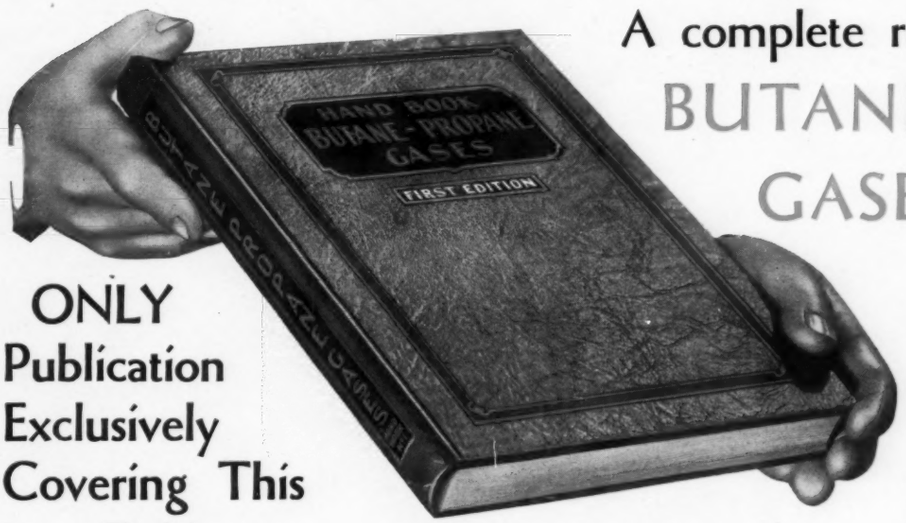

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THIS Handbook comes in response to a very definite need. A tremendous amount of development work has been accomplished for the liquefied petroleum gas industry in a brief space of time, with many companies participating. And to date there has been no one source to which the industry could go for information on all phases of the field. This is the mission of the *Handbook of Butane-Propane Gases*—consolidating and organizing all of these reference data under one cover.

The editors have established close contact with all branches of the liquefied gas industry—production, bottled gas and town plant distribution, gas enrichment—and to assure a high standard of technical excellence for the Handbook leading figures in the industry have extended their cooperation as contributors.

In the next column contents of the *Handbook of Butane-Propane Gases* are reviewed. No phase of the field is neglected, and every major subject heading is treated in detail, making the Handbook an outstanding reference work. Numerous tables, charts and illustrations add to its value.

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CONTENTS

A CHRONOLOGY OF LIQUID GAS DEVELOPMENT: Beginnings with Blaugas; first liquid natural gas sets; early industrial uses; expansion in domestic marketing; history of equipment; butane plant designs of early days. **PHYSICAL PROPERTIES OF THE LIQUEFIED PETROLEUM GASES:** Table of constants; discussion of general characteristics; vapor pressures; viscosity; specific gravities; combustion data; dew points of the pure gases carburetted with air; mean specific heats. **PROPERTIES OF BUTANE-PROPANE MIXTURES AND RELATION OF PROPERTIES TO TEMPERATURES:** Calculation of properties; calculation of vapor pressures; evaporation of mixtures; calculation of relative quantities evaporated; dew points of mixtures. **COMPOSITION AND ANALYTICAL DETERMINATION OF LIQUEFIED PETROLEUM GASES:** Specifications for commercial grades of propane and butanes; conventional gas analytical tests; low temperature fractionation analysis; description and operation of apparatus; calculations for liquid analysis; automatic operation; interpretation and computation on basis of low temperature fractionation analysis results. **THE MANUFACTURE OF LIQUEFIED PETROLEUM GAS:** Methods and processes in the natural gasoline industry; plant flow scheme for liquefied petroleum gas production; single column rectification; double column rectification with a finished gasoline from the primary unit; double column rectification with finished gasoline from secondary column; weathering; blending; handling from storage. **TRANSPORTATION OF LIQUEFIED PETROLEUM GASES:** Physical properties; grades of product; I.C.C. regulations; Reid method for vapor pressure determination; shipping in cylinders; tank car shipments; transportation by motor truck; pipe lines for butane; water transportation. **THE USE OF BUTANE AND PROPANE WITH MANUFACTURED GAS:** Calculations; enrichment of manufactured gas transmitted under high pressure; use of propane to meet peak loads; use of butane or propane as a substitute for gas oil for the carburetion of carburetted water gas; use of propane or butane for heating gas underfired coke ovens to reduce coke production. **CENTRAL PLANTS FOR BUTANE-AIR SERVICE:** The butane-air process; liquid storage; vaporization; carburetion; control; dehydration; odorization; gas storage; distribution; burner adjustment; conversion plants; representative flow sheets. **CENTRAL PLANTS FOR UNDILUTED BUTANE-PROPANE VAPOR SERVICE:** Field of usefulness of the undiluted vapor system; specifications for a suitable liquefied gas; estimating size and characteristics of the central plant load; design of gas plant; design of distribution system. **LIQUEFIED PETROLEUM GASES AS INDUSTRIAL FUELS:** Unloading and storage system; vaporizing system; mixing system; plant distribution system; atmospheric burners; low pressure combustion systems; diffusion combustion; typical applications; conversion problems, gas-fired equipment; conversion problems, liquid and solid fuel-fired equipment. **APPLIANCE UTILIZATION OF LIQUEFIED PETROLEUM GASES:** Combustion of propane, butane and commercial mixtures of these gases; burner orifice capacities; capacity of service pipe and house piping; general requirements for burners of all domestic appliances; gas ranges; space heaters; water heaters; lighting fixtures; draft diverters; cost of commercial propane compared with natural gas, manufactured gas and electricity. **BOTTLED GAS DISTRIBUTION OF LIQUEFIED PETROLEUM GASES:** The bottled gas field, present and future; equipment for bottled gas service; units engaged in distribution; economics of two-drum distribution; one-drum distribution; customer contracts; lease of equipment; selling through agents; sale by local agent; essentials in permanent market building; National Bottled Gas Association's tentative code of marketing practices; Underwriters' regulations relating to equipment and installations. **MISCELLANEOUS:** Table of flow of gas at low pressure through pipe lines; National Fire Protection Association's regulations pertaining to liquefied petroleum gas systems, other than those using portable containers. **CATALOGUE SECTION:** Detailed information on products designed for butane-propane service. **BUYERS' GUIDE:** A commodity listing of firms supplying equipment, appliances or services for the liquefied petroleum gas industry. **DIRECTORY OF CENTRAL PLANTS; BIBLIOGRAPHY; INDEX.**

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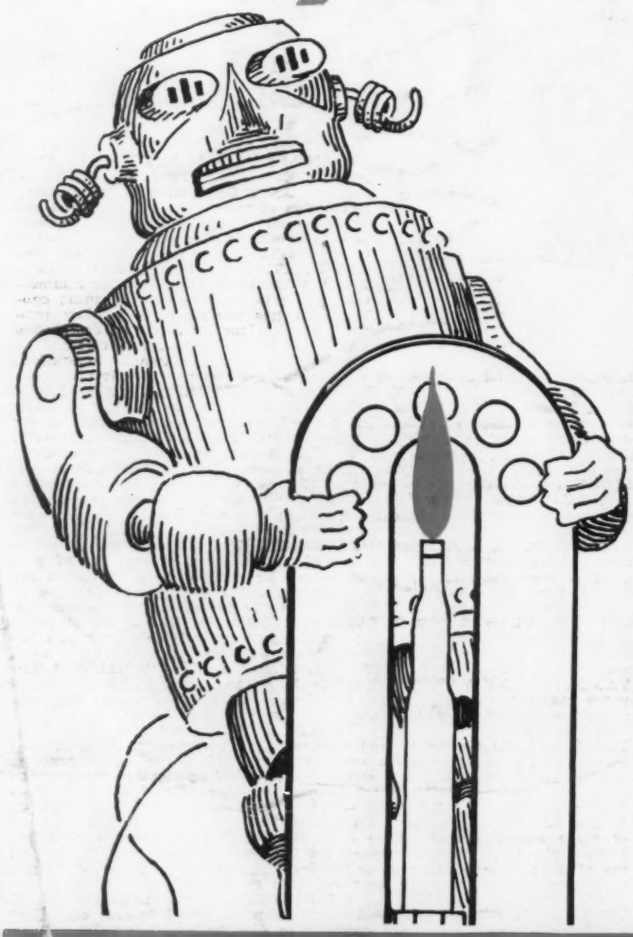

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